

AD-A105 885

HOSKINS-WESTERN-SONDEREGGER INC LINCOLN NE  
NATIONAL DAM SAFETY PROGRAM. EASTERDAY DAM (MO 10950), MISSISSI--ETC(U)  
JUN 79 R S DECKER, G JAMISON, G ULMER

F/6 13/13

DACW43-79-C-0046

NL

UNCLASSIFIED

1 OF 1  
AD-A  
105 885

END  
DATE  
FILMED  
11-81  
DTIC

**LEVEL**



**MISSISSIPPI - KASKASKIA - ST. LOUIS BASIN**

**EASTERDAY DAM**

**MONTGOMERY COUNTY, MISSOURI**

**MO. 10950**

**AD A105885**

**PHASE 1 INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM**



**United States Army  
Corps of Engineers**  
... Serving the Army  
... Serving the Nation

**St. Louis District**

**DTIC  
ELECTE**  
**S** **D**  
**OCT 21 1981**  
**A**

**DTIC FILE COPY**

**PREPARED BY: U.S. ARMY ENGINEER DISTRICT, ST. LOUIS**

**FOR: STATE OF MISSOURI**

**JUNE, 1979**

This document has been approved  
for public release and sale; its  
distribution is unlimited.

**10 10 19**

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. <u>AD-A105</u>	3. RECIPIENT'S CATALOG NUMBER <u>885</u>
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Easterday Dam (MO 10950) Montgomery County, Missouri		5. TYPE OF REPORT & PERIOD COVERED <u>Final Report</u>
7. AUTHOR(s) Hoskins-Western-Sonderegger, Inc.		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		8. CONTRACT OR GRANT NUMBER(s) <u>12</u> <u>DACW43-79-C-0046</u>
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS <u>10571</u>
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) <u>11</u> National Dam Safety Program, Easterday Dam (MO 10950), Mississippi - Kaskaskia St. Louis Basin, Montgomery County, Missouri. Phase I Inspection Report.		12. REPORT DATE <u>June 29 79</u>
16. DISTRIBUTION STATEMENT Approved for release; distribution unlimited.		13. NUMBER OF PAGES Approximately 60
		15. SECURITY CLASS. (of this report) <u>UNCLASSIFIED</u>
		17. DECLASSIFICATION/DOWNGRADING SCHEDULE
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  Dam Safety, Lake, Dam Inspection, Private Dams		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.		

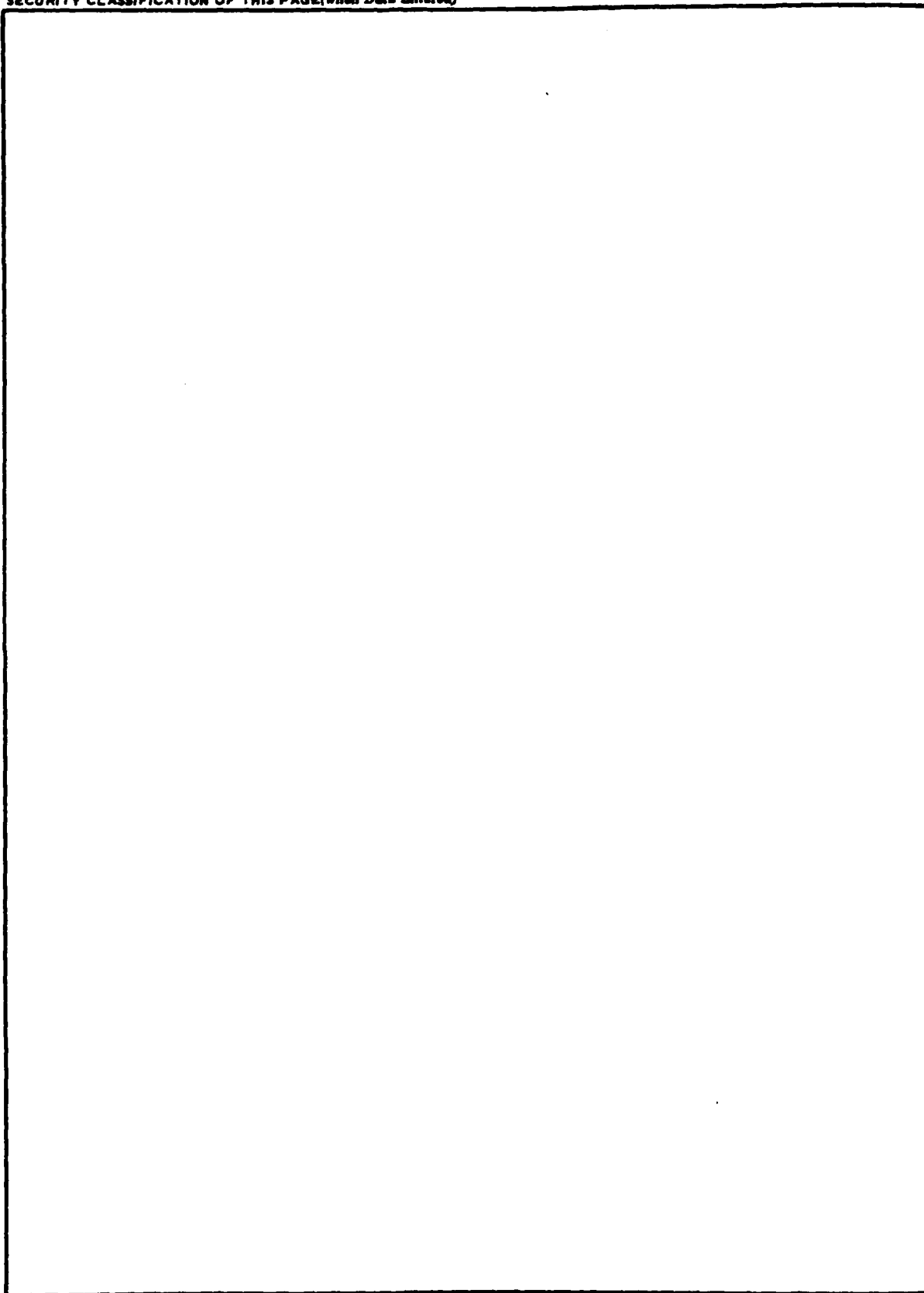
DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)



SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

0 350 25

FORM 3

EASTERDAY DAM  
MONTGOMERY COUNTY, MISSOURI  
MO. 10950

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

PREPARED BY  
HOSKINS-WESTERN-SONDEREGGER, INC.  
CONSULTING ENGINEERS  
LINCOLN, NEBRASKA

UNDER DIRECTION OF  
ST. LOUIS DISTRICT, CORPS OF ENGINEERS  
FOR  
GOVERNOR OF MISSOURI  
JUNE, 1979

By	
Distribution/	
Availability Codes	
Avail and/or	
A	



DEPARTMENT OF THE ARMY  
ST. LOUIS DISTRICT CORPS OF ENGINEERS  
210 TUCKER BOULEVARD, NORTH  
ST. LOUIS, MISSOURI 63101

REPLY TO  
ATTENTION OF

LMSD-FI

28 December 1979

SUBJECT: Easterday Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Easterday Dam (Mo. 10950).

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, emergency by the St. Louis District as a result of the application of the following criteria:

a. Spillway will not pass a 10-year frequency flood without overtopping of the dam. The spillway is, therefore, considered to be unusually small and seriously inadequate.

b. Overtopping could result in dam failure.

c. Dam failure significantly increases the hazard to life and property downstream.

Submitted By:

SIGNED

Chief, Engineering Division

26 FEB 1980

Date

Approved By:

SIGNED

Colonel, CE, District Engineer

26 FEB 1980

Date

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

TABLE OF CONTENTS

<u>PARAGRAPH NO.</u>	<u>TITLE</u>	<u>PAGE NO.</u>
	Assessment Summary	
	Overview Photograph	
	SECTION 1 - PROJECT INFORMATION	
1.1	General	1
1.2	Description of Project	1
1.3	Pertinent Data	2
	SECTION 2 - ENGINEERING DATA	
2.1	Design	5
2.2	Construction	5
2.3	Operation	5
2.4	Evaluation	5
	SECTION 3 - VISUAL INSPECTION	
3.1	Findings	6
3.2	Evaluation	8
	SECTION 4 - OPERATIONAL PROCEDURES	
4.1	Procedures	9
4.2	Maintenance of Dam	9
4.3	Maintenance of Operating Facilities	9
4.4	Description of Any Warning System in Effect	9
4.5	Evaluation	9
	SECTION 5 - HYDRAULIC/HYDROLOGIC	
5.1	Evaluation of Features	10
	SECTION 6 - STRUCTURAL STABILITY	
6.1	Evaluation of Structural Stability	12
	SECTION 7 - ASSESSMENT/REMEDIAL MEASURES	
7.1	Dam Assessment	13
7.2	Remedial Measures	13

## APPENDIX A - MAPS

Plate A-1	Vicinity Topography
Plate A-2	Location Map

## APPENDIX B - PHOTOGRAPHS

Plate B-1	Photo Index	
Plate B-2	Photo No. 2	Overview Of Dam From Upstream On Right Side
	Photo No. 3	Upstream Slope From Right Side
Plate B-3	Photo No. 4	Crest From Right Side. Note Trees And Erosion of Upstream Slope.
	Photo No. 5	Downstream Slope From Right Showing Tree Growth
Plate B-4	Photo No. 6	Upstream Across Lake From Sta. 4+00
	Photo No. 7	Upstream Slope From Left Showing Erosion And Tires Used As Slope Protection
Plate B-5	Photo No. 8	Downstream From Sta. 1+80+
	Photo No. 9	Seep Area In Right Abutment Trough
Plate B-6	Photo No. 10	Spillway Entrance On Left Side
	Photo No. 11	View Looking Across Spillway From Left Dam In Background
Plate B-7	Photo No. 12	View Looking Downstream In Spillway
	Photo No. 13	View Looking Upstream In Spillway

## APPENDIX C - PROJECT PLATES

Plate C-1	Phase I - Plan and Centerline Profile of Dam
Plate C-2	Phase I - Section of Dam, Profile and Sections of Spillway

## APPENDIX D - HYDRAULIC AND HYDROLOGIC DATA

Plates D-1 & D-2	Hydrologic Computations
Plate D-3	Spillway Rating Curve
Plate D-4	Ratio Runoff Curves
Plates D-5 to D-15	Computer Input and Output for Ratios of PMF
Plates D-16 to D-33	Computer Input and Output for 10-year Flood



PHASE I REPORT  
NATIONAL DAM SAFETY PROGRAM  
ASSESSMENT SUMMARY

Name of Dam	Easterday Dam
State Located	Missouri
County Located	Montgomery County
Stream	Tributary to Smith Branch
Date of Inspection	June 28, 1979

Easterday Dam was inspected by an interdisciplinary team of engineers from Hoskins-Western-Sonderregger, Inc. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers, and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. Failure would threaten life and property. The estimated damage zone extends approximately three miles downstream of the dam. Within the damage zone are two dwellings, several outbuildings, a power transmission line, a highway bridge and State Highway 161.

Our inspection and evaluation indicates that the spillway does not meet the criteria set forth in the recommended guidelines for a small size dam having a high hazard potential.

Considering the small volume of water impounded and the large downstream flood plain, one-half of the Probable Maximum Flood is the appropriate spillway design flood. The spillway of this dam will not pass the 100-year flood (flood having a one percent chance of being exceeded in any year) nor will it pass the 10-year flood without overtopping the dam. The spillway has the capacity to pass 9% of the Probable Maximum Flood without overtopping the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

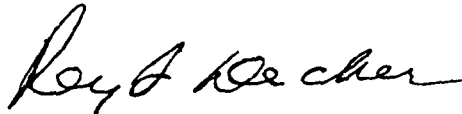
This dam is severely deficient in spillway capacity. In addition, the erosion of the upstream slope would indicate that overtopping could result in serious damage to or possible failure of the dam.

Recommendations presented in Paragraph 7.2a. of this report relative to increasing the spillway capacity and/or the storage capacity of the reservoir should be pursued immediately.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" should be obtained and used in designing any modification of this dam.

Modifications required in order to increase the safety of this dam should include the removal of trees and shrubs from both faces of the embankment and the crest, reestablishment of the upstream slope to eliminate the eroded areas, placement of erosion resistant materials on the upstream slope and establishment of a drain system to collect seepage water and to eliminate the ponding of water downstream from the toe.

Very little maintenance work has been done on this dam as evidenced by the tree and shrub growth as well as the erosion of the upstream slope.



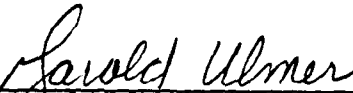
---

Rey S. Decker  
E-3703



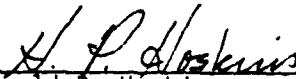
---

Gordon Jamison



---

Garold Ulmer  
E-4777



---

Harold P. Hoskins  
Chairman of Board  
Hoskins-Western-Sonderegger, Inc.  
E-8696



PHOTO NO. 1 - OVIUM

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
EASTERDAY DAM - MO 10950  
MONTGOMERY COUNTY, MISSOURI

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

- a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Easterday Dam be made.
- b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.
- c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams", Appendix D to "Report of the Chief of Engineers on the National Program of Inspection of Dams", dated May, 1975, and published by the Department of the Army, Office of the Chief of Engineers.

1.2 DESCRIPTION OF PROJECT

- a. Description of Dam and Appurtenances.
  - (1) The dam is an earth fill about 600 feet long and 33.6 feet in height located in gently rolling hills of central Missouri.
  - (2) The spillway consists of an earth channel excavated through the left abutment.
  - (3) Pertinent physical data are given in paragraph 1.3 below.

- b. Location. The dam is located in the central portion of Montgomery County, Missouri, as shown on Plate A-2. The dam is shown on Plate A-1 in the NW $\frac{1}{4}$  of Section 20, T48N, R5W. The lake formed behind the dam is shown in the W $\frac{1}{2}$  of Section 20, T48N, R5W.
- c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, this dam and impoundment is in the small size category.
- d. Hazard Classification. Guidelines for determining the hazard classification are presented in the same guidelines as referenced in paragraph 1.1c above. Based on referenced guidelines, this dam is in the High Hazard Classification. The estimated damage zone extends approximately three miles downstream from the dam. Within the damage zone are two dwellings, several outbuildings, a power transmission line, a highway bridge and State Highway 161.
- e. Ownership. The dam is in perpetual trust in the E. E. Easterday Estate. The estate is represented by McQuie and Deiter, Attorneys, Montgomery City, Missouri 63361.
- f. Purpose of Dam. The dam was originally constructed to impound stock water and later enlarged for recreational purposes.
- g. Design and Construction History. It was reported by Mrs. S. E. Pierson, former owner, that the dam was constructed in 1951 for stock water. It was raised in 1953 and raised again in 1954 or 1955 after it had changed ownership from Pierson to Easterday. The original structure had a spillway on the right abutment which was closed by Easterday in 1954-55 when the present makeshift spillway was constructed on the left abutment. The last raise added about 10 feet to the height of the dam.
- h. Normal Operating Procedures - None.

### 1.3 PERTINENT DATA

- a. Drainage Area. 159.5 acres (0.249 square miles).
- b. Discharge at Damsite.
  - (1) All discharges at the damsite are through an uncontrolled earthen spillway at the left end of the dam. The spillway has no uniform shape and has very poor vegetative cover.

- (2) Estimated maximum flood at damsite - unknown.
- (3) The spillway capacity varies from 0 c.f.s. at elevation 811.6 feet to 33 c.f.s. at the minimum top of dam (elevation 812.6 feet).
- (4) Total spillway capacity at the minimum top of dam is 33 c.f.s.±
- c. Elevations (feet above M.S.L.).
  - (1) Top of dam - 812.6 (low point, see Plate C-1)
  - (2) Spillway crest - 811.6±
  - (3) Streambed at centerline - 779±
  - (4) Maximum Tailwater - unknown
- d. Reservoir. Length (feet) of maximum pool - 1600±
- e. Storage (Acre-feet).
  - (1) Top of dam (low point) = 273±
  - (2) Spillway crest = 258±
- f. Reservoir Surface (Acres).
  - (1) Top of dam - 25±
  - (2) Spillway crest - 24±
- g. Dam.
  - (1) Type - earth fill
  - (2) Length - 600 feet +
  - (3) Height - 33.6 feet ±
  - (4) Top width - 12 feet ±
  - (5) Side slopes
    - (a) Downstream - Variable, 1.8H on 1V at top, 2.9H on 1V mid way down.
    - (b) Upstream - Near vertical for upper 3 feet; then 3H ± on 1V.
  - (6) Zoning - Unknown
  - (7) Impervious core - unknown
  - (8) Cutoff - unknown
  - (9) Grout curtain - unknown
  - (10) Wave protection - Limestone rock, rubber tires and trash.
  - (11) Internal drainage - Unknown.
- h. Diversion Channel and Regulating Tunnel. None
- i. Spillway.
  - (1) Principal (and only)

- (a) Type - uncontrolled channel excavated in left abutment.
- (b) Control section - Trapezoidal section with 5 foot bottom width, variable side slopes, and 50 foot+ length located downstream from the centerline of the dam.
- (c) Crest elevation - 811.6 feet +
- (d) Upstream Channel - Open, earth channel on 6.8% + slope.
- (e) Downstream Channel - Open, earth channel on 2%+ slope outletting into the woods.

j. Regulating Outlets. None

## SECTION 2 - ENGINEERING DATA

### 2.1 DESIGN

No design data were available for this dam.

### 2.2 CONSTRUCTION

No construction data were available. It was reported by Mrs. S. E. Pierson that the dam was built in 1951 and raised in 1953 and again in 1954 or 1955.

### 2.3 OPERATION

No data were available on spillway operation.

### 2.4 EVALUATION

- a. Availability. No data were available.
- b. Adequacy. The field surveys and visual observation presented herein are considered adequate to support the conclusion of this report. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.
- c. Validity. Not applicable.



## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

- a. General. A visual inspection of the Easterday Dam was made on June 28, 1979. Engineers from Hoskins-Western-Sonderegger, Inc., Lincoln, Nebraska, making the inspection were: R. S. Decker, Geotechnical; Gordon Jamison, Hydrology; Garold Ulmer, Civil Engineer. A representative of the Easterday Estate was not present during the inspection. Mrs. S. E. Pierson, former owner of the dam, was interviewed prior to the inspection.
- b. Dam.
  - (1) Geology and Soils (Abutment and Embankment). Upland soils in the area are silty clay loam (CL) loessial materials. Soils exposed in the left abutment (spillway cut) were CH materials, possibly glacial till. Some cherty gravel was evident. No slumps or slides were observed on the abutments. Borings on the embankment showed CL-CH materials to depths of 1.5 to 2 feet. Bedrock was not exposed in the area but probably consists of shales of the Cherokee group, lower Pennsylvanian System.
  - (2) Upstream Slope. The upstream face is badly eroded to a near vertical face from the crest line down about 3 feet to the top of the riprap. Several areas of this eroded section have been covered with old rubber tires and other trash in an attempt to control the erosion above the riprap. The reservoir level was about 3 feet below the top of the riprap when inspected. There are many trees and shrubs growing on the face.
  - (3) Crest. The alignment of the crest is very irregular and the profile varies in elevation from 813.7 ft.+ to 812.6 ft.+ . The crest is sparsely vegetated with grass and weeds. Many trees and shrubs are growing on the crest. No rodent holes, cracks or significant deformations were noted. Soils on the crest were plastic clays (CH).

- (4) Downstream Slope. The downstream slope has many growing shrubs and trees, most of which are cedar and hardwoods with a fair grass cover in the open areas. There is a definite change in slope about 6 to 7 feet vertically down the slope from the crest. This did not appear to be lateral deformation and probably results from raising the dam. No cracks, slumps or rodent holes were observed on the slope.

Seepage was observed in the left abutment trough downstream from about stations 1+75 to 2+00. This seep outcrops about halfway up the slope from the toe of the dam. Seepage was also noted at the toe of the dam downstream from station 3+70 (maximum section). Seepage in the right abutment trough outcrops at about elevation 800 ft. which is about one third of the way down the trough from the crest of the dam. Most seepage on the right end of the dam shows up 20 to 30 feet downstream from the toe. All seepage was clear and ponded. Seepage flows were not perceptible, and it was not possible to estimate the quantities of seepage.

- (5) Miscellaneous. Although materials observed in the embankment were primarily CL-CH, the severe erosion of the upstream face would indicate that any significant overtopping of the dam could cause serious damage.

c. Appurtenant Structures.

- (1) The spillway is a poorly defined, makeshift channel of irregular section excavated through CL-CH materials on the left end of the dam. It has a broad approach section, narrow control section and broad exit channel. It is sparsely vegetated with grass. There was no evidence of recent flow in the spillway and no significant erosion in the channel.
- (2) Drawdown Facilities. There are no drawdown facilities for this dam.

- d. Reservoir Area. No significant erosion was observed around the shoreline of the reservoir nor were there any slumps or slides apparent.
- e. Downstream Channel. There was no apparent channel downstream from the spillway. It discharges on the wooded hillside. The old creek channel downstream from about station 3+70 is overgrown with trees and shrubs.

### 3.2 EVALUATION

This structure appears to be in poor condition with a definite potential of failure. The poor physical layout and construction of the spillway, the erosion of the upstream face and the relatively high elevation of seepage outcrops on the dam and in the abutment troughs indicate that maximum reservoir levels could cause serious damage to the dam.

## SECTION 4 - OPERATIONAL PROCEDURES

### 4.1 PROCEDURES

There are no controlled outlet works for this dam. The pool level is controlled by rainfall, infiltration, evaporation, and the capacity of the uncontrolled spillway.

### 4.2 MAINTENANCE OF DAM

There does not appear to be any regular maintenance on this dam. The attempt to control erosion on the upstream face with rubber tires is the only indication of maintenance.

### 4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist at this dam.

### 4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning system in effect for this dam.

### 4.5 EVALUATION

There appears to be a serious potential of failure of this structure due to lack of maintenance and to an inadequate spillway.

## SECTION 5 - HYDRAULIC/HYDROLOGIC

### 5.1 EVALUATION OF FEATURES

- a. Design Data. No design data were found for this dam.
- b. Experience Data. The drainage area, reservoir surface area, and elevation-storage data were developed from the USGS Montgomery City and New Florence, Missouri 7 1/2 minute topographic quadrangle maps. The hydraulic computations for the spillway and dam overtopping discharge ratings were based on data collected in the field at the time of the field inspection.
- c. Visual Observations.
  - (1) Lack of suitable riprap material on the upstream face of the dam is a serious deficiency.
  - (2) Lack of vegetation for a protective cover in the spillway channel plus an apparent lack of maintenance could also result in serious consequences.
  - (3) Poor physical layout and construction of the spillway channel results in inefficient spillway operation.
- d. Overtopping Potential. The spillway is too small to pass 50% of the probable maximum flood without overtopping. The spillway is too small to pass the 100-year as well as the 10-year flood without overtopping. The spillway will pass 9% of the probable maximum flood without overtopping. Any significant overtopping of this dam could cause serious damage and possible failure. The results of the routings through the dam are tabulated in regards to the following conditions:

<u>Frequency</u>	<u>Inflow Discharge c.f.s.</u>	<u>Outflow Discharge c.f.s.</u>	<u>Maximum Pool Elevation</u>	<u>Freeboard Top of Dam Min. Elev. 812.6</u>	<u>Time Dam Overtopping Hrs.</u>
10 yr.	450	50	812.8	-0.2	5-
100 yr.	700	270	813.1	-0.5	7+
0.5 PMF	1200	1000	813.6	-1.0	11-
PMF	2350	2100	814.0	-1.4	15+
* 0.09	210	33	812.6	0	-

\* Percent PMF passed by the spillway.

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and a small size. Therefore, the 1/2 PMF to PMF is the test for the adequacy of the dam and its spillway.

The estimated damage zone is described in Paragraph 1.2d in this report.

## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observation. Seepage outcrops through the embankment and abutments are located relatively high with respect to basal elevations of the dam. The nature or cause of the irregularity in the downstream slope is unknown. Additional studies would be required to assess the structural stability of the dam with respect to shear strength and seepage pressures. Analyses presented in Section 5 of this report indicate that the dam will be overtopped with 0.2 foot of flow for about 5 hours by the 10-year flood and by 1 foot of flow for 11 hours by 50% of the probable maximum flood. The effects of such overtopping on the erosional stability of the dam are not known, but it appears that serious damage or failure of the dam would result.
- b. Design and Construction Data. No design or construction data were available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.
- c. Operating Records. There are no controlled operating facilities for this dam.
- d. Post Construction Changes. It was reported by Mrs. S. E. Pierson that the dam was raised in 1953 and again in 1954 or 1955 and that the original spillway on the right abutment was closed. The present spillway was constructed at the time the dam was last raised.
- e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of the magnitude predicted in this area is not expected to cause structural failure of this dam.

## SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

### 7.1 DAM ASSESSMENT

- a. Safety. This dam appears to have a serious potential of failure. The approximate data available for analyses in Section 5 indicates that the dam will be overtopped by the 10-year flood occurrence. Additional studies would be required to determine the effects of such overtopping on the structural and erosional stability of the embankment and the spillway. Additional studies would also be required to assess the structural stability of the dam from the standpoint of shear strength and seepage pressures. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency.
- b. Adequacy of Information. Due to the lack of engineering data, the conclusions in this report are based upon performance history and visual observations. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency.
- c. Urgency. The items recommended in paragraph 7.2.a should be pursued immediately.
- d. Necessity for Phase II. Phase II investigation is not considered necessary.
- e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of this magnitude is not expected to be hazardous to this dam.

### 7.2 REMEDIAL MEASURES

- a. Alternatives.
  - (1) Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" should be obtained on a high priority basis.

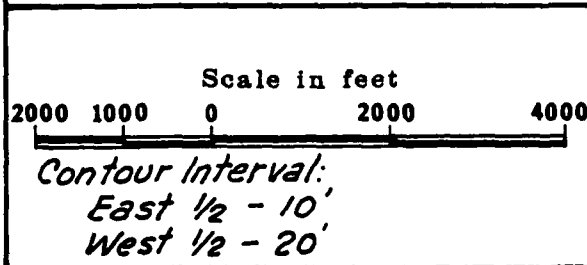
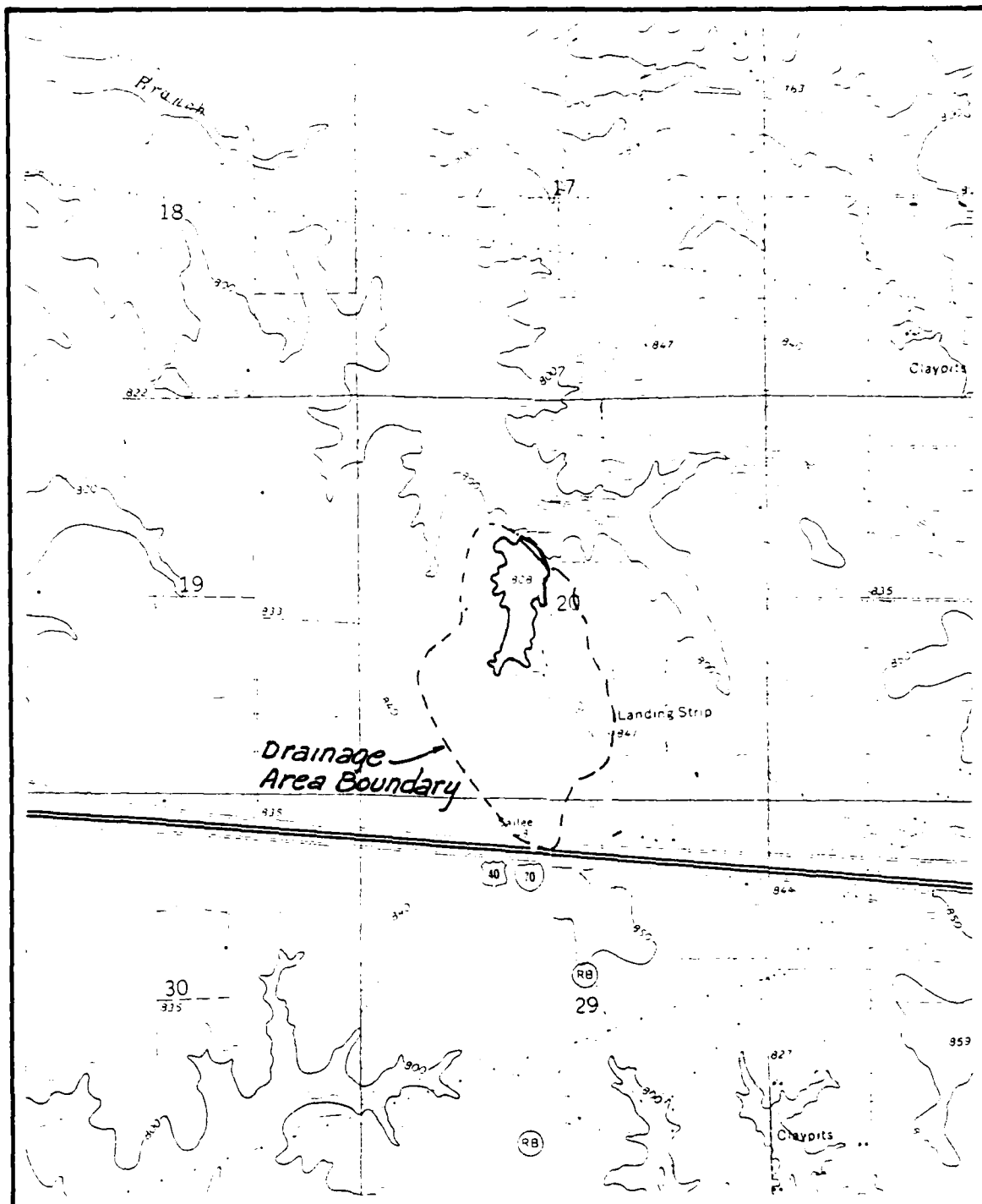


- (2) Hydrologic studies should be made to determine the increase in the height of the dam and/or the size of the spillway that is necessary to pass 50% of the probable maximum flood without overtopping the dam.
- (3) All trees and shrubs should be removed from the embankment slopes and the crest prior to any modification work. Large roots should be removed and the voids filled with compacted earth. This work should be done under the guidance of an engineer experienced in design and construction of dams.
- (4) The upstream slope should be reconstructed to eliminate the eroded areas, and riprap or comparable wave erosion resistant materials should be placed on the newly created slope.
- (5) Modification studies should include the establishment of a drain system to collect seepage water and to eliminate ponding of the seepage water.
- (6) The services of an engineer experienced in the design and construction of dams should be obtained to design and supervise the installation of the protective measures described above.

b. O and M Procedures.

- (1) Maintenance of this dam in its present condition is lower in priority than the modification work recommended in paragraph 7.2a.
- (2) After modification, a program of periodic inspection should be initiated to prevent growth of trees and shrubs, to repair any erosion on a timely basis and to monitor and maintain records on seepage discharges.

APPENDIX A  
MAPS

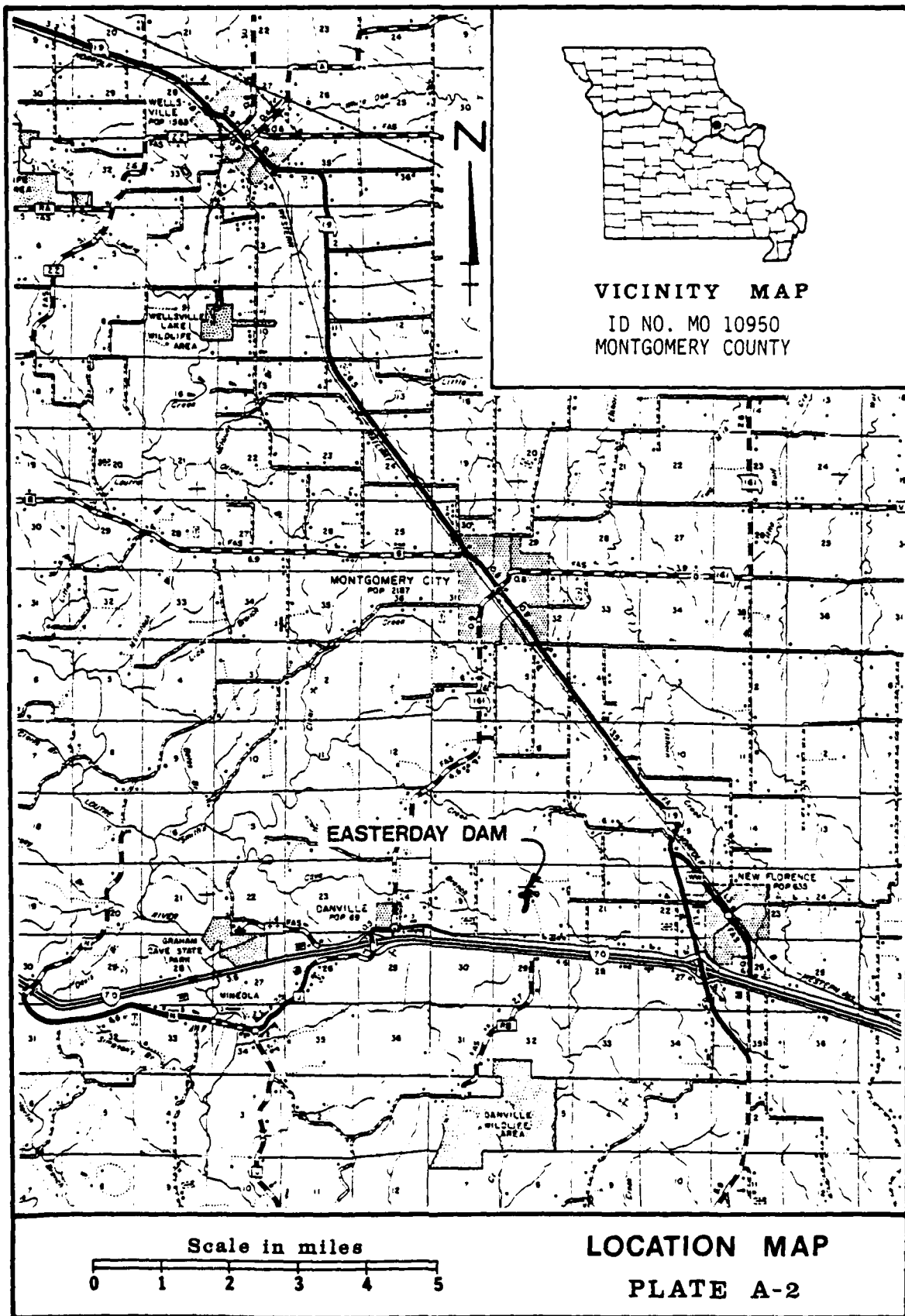


# VICINITY TOPOGRAPHY EASTERDAY DAM

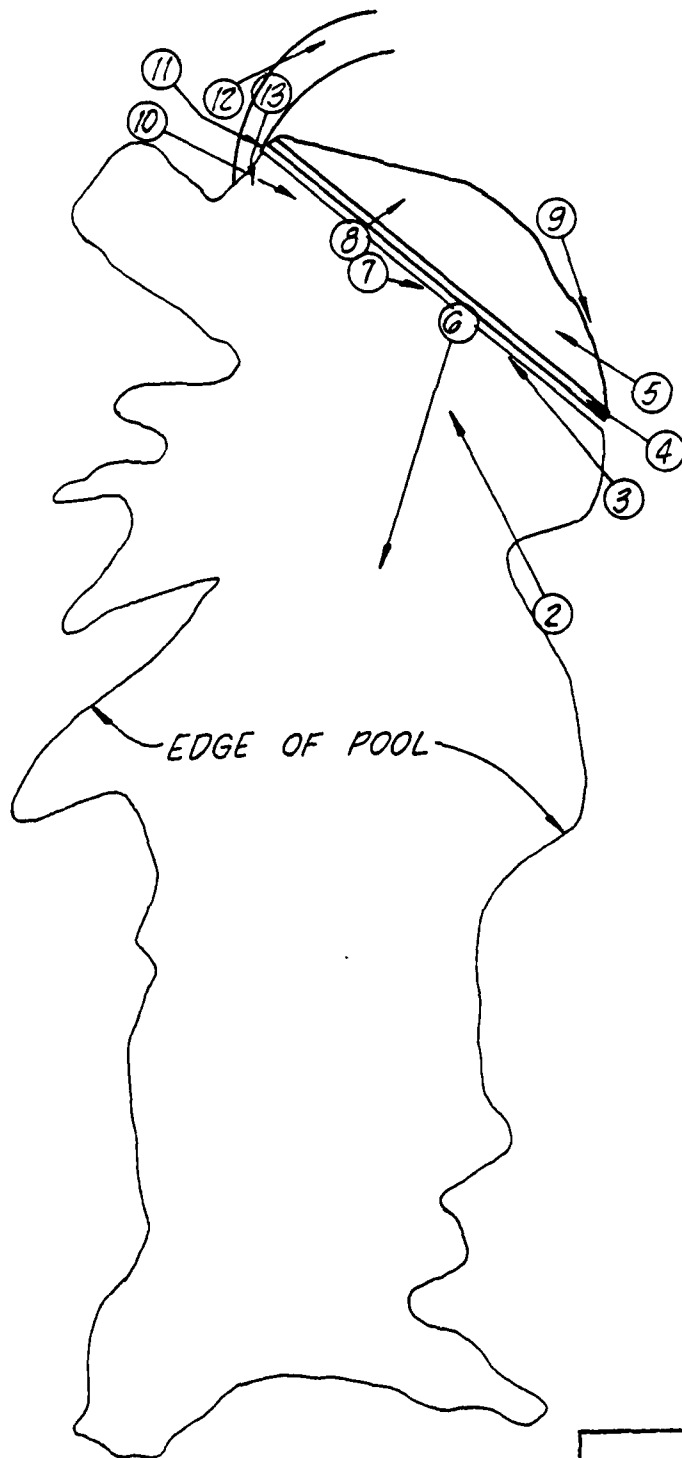
MONTGOMERY COUNTY, MO.

MO. 10950

PLATE A-1



APPENDIX B  
PHOTOGRAPHS



Scale: 1"=200'

**PHOTO INDEX**  
**EASTERDAY DAM**  
**MONTGOMERY COUNTY, MISSOURI**  
**MO. 10950**

PLATE B-1



PHOTO NO. 2 - OVERVIEW OF DAM FROM UPSTREAM ON RIGHT SIDE.



PHOTO NO. 3 - UPSTREAM SLOPE FROM RIGHT SIDE.



PHOTO NO. 4 - CREST FROM RIGHT SIDE. NOTE TREES AND  
EROSION OF UPSTREAM SLOPE.



PHOTO NO. 5 - DOWNSTREAM SLOPE FROM RIGHT SHOWING TREE GROWTH.





PHOTO NO. 6 - UPSTREAM ACROSS LAKE FROM STA. 4 + 00.



PHOTO NO. 7 -  
UPSTREAM SLOPE FROM  
LEFT SHOWING EROSION  
AND TIRES USED AS  
SLOPE PROTECTION.

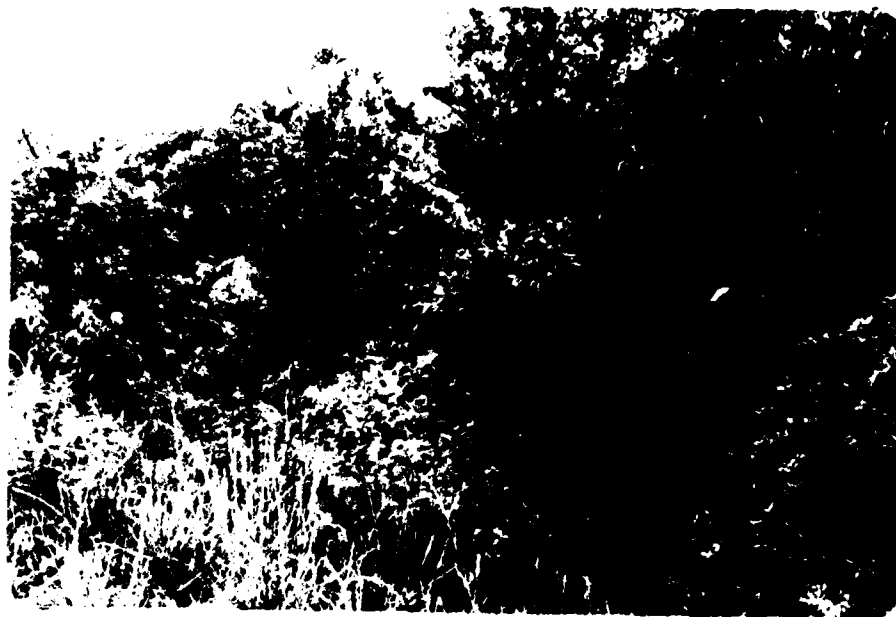


PHOTO NO. 8 - DOWNSTREAM FROM STA. 1 + 80=.



PHOTO NO. 9 - SEEP AREA IN RIGHT ABUTMENT TROUGH.



PHOTO NO. 10 - SPILLWAY ENTRANCE ON LEFT SIDE.



PHOTO NO. 11 - VIEW LOOKING ACROSS SPILLWAY FROM LEFT.  
DAM IN BACKGROUND.



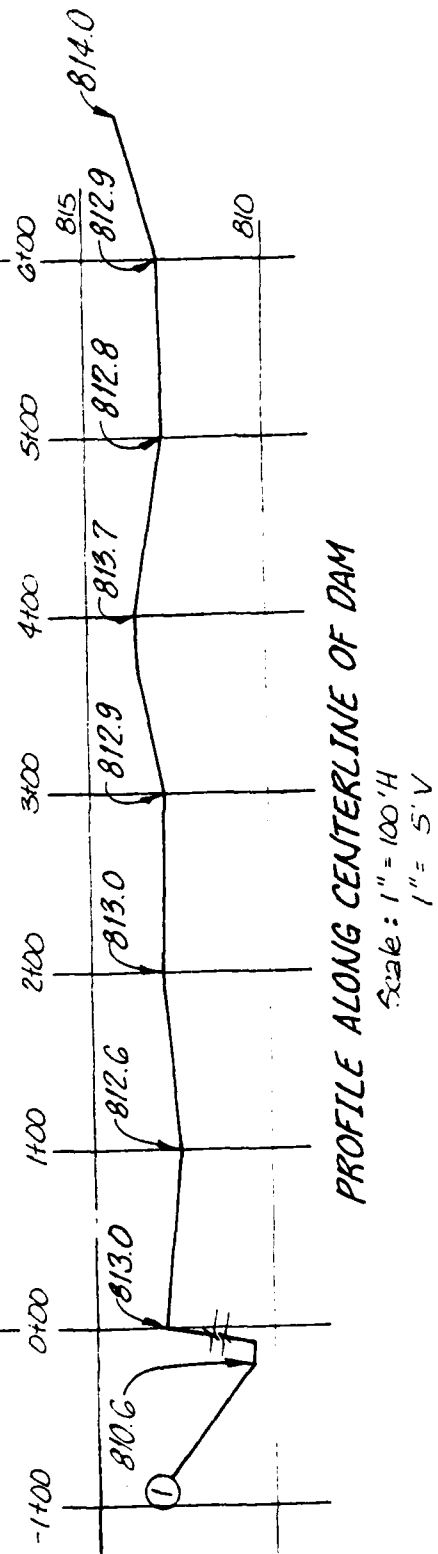
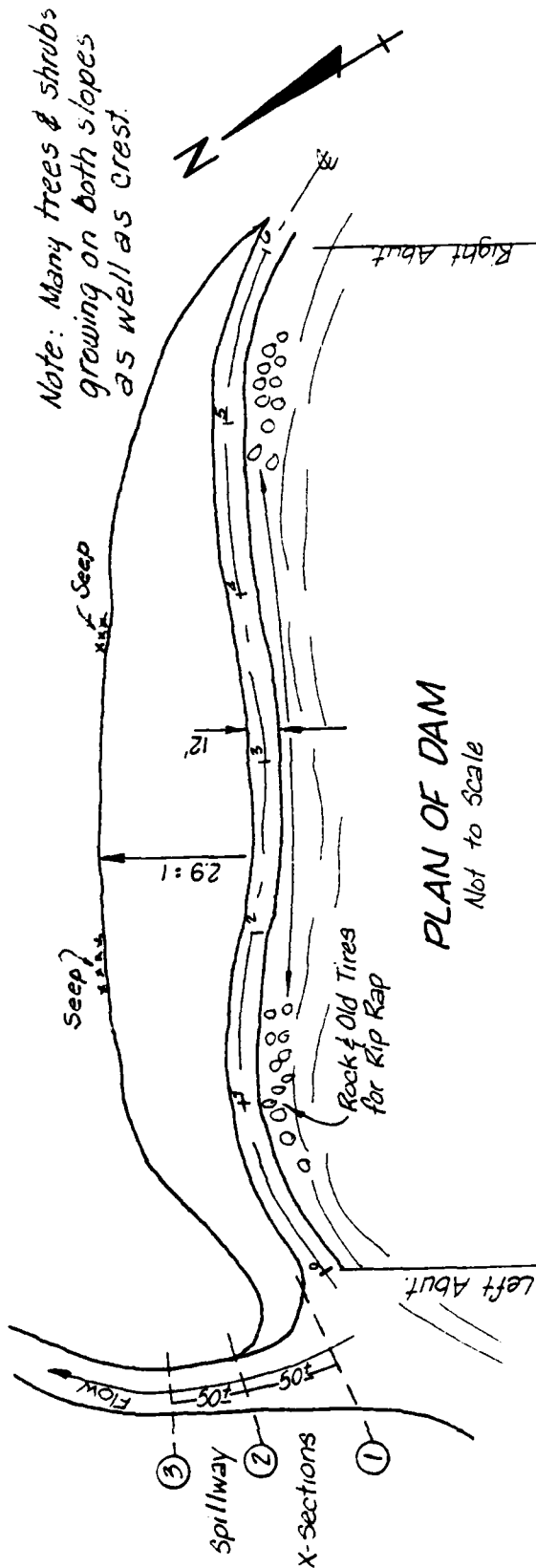
PHOTO NO. 12 - VIEW LOOKING DOWNSTREAM IN SPILLWAY.

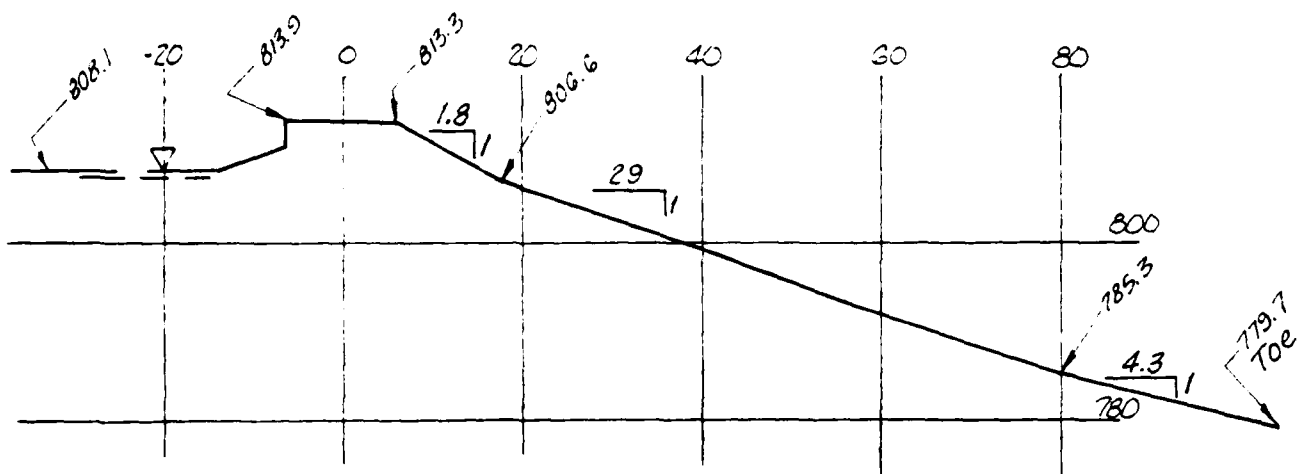


PHOTO NO. 13 - VIEW LOOKING UPSTREAM IN SPILLWAY.

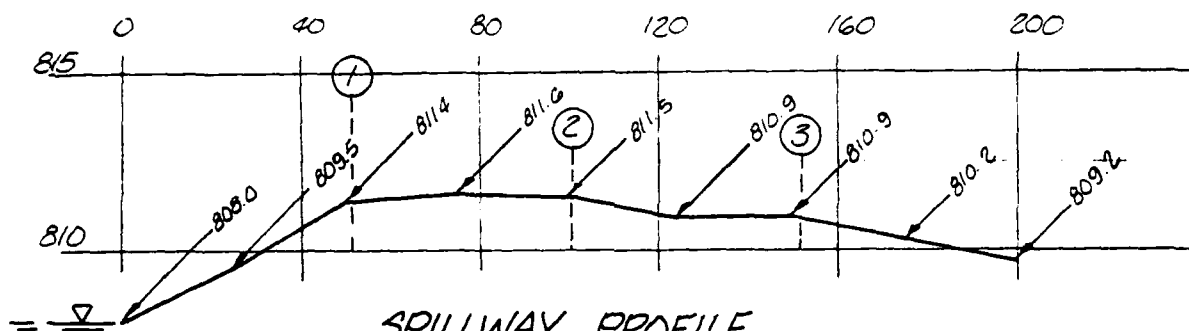
2

APPENDIX C  
PROJECT PLATES

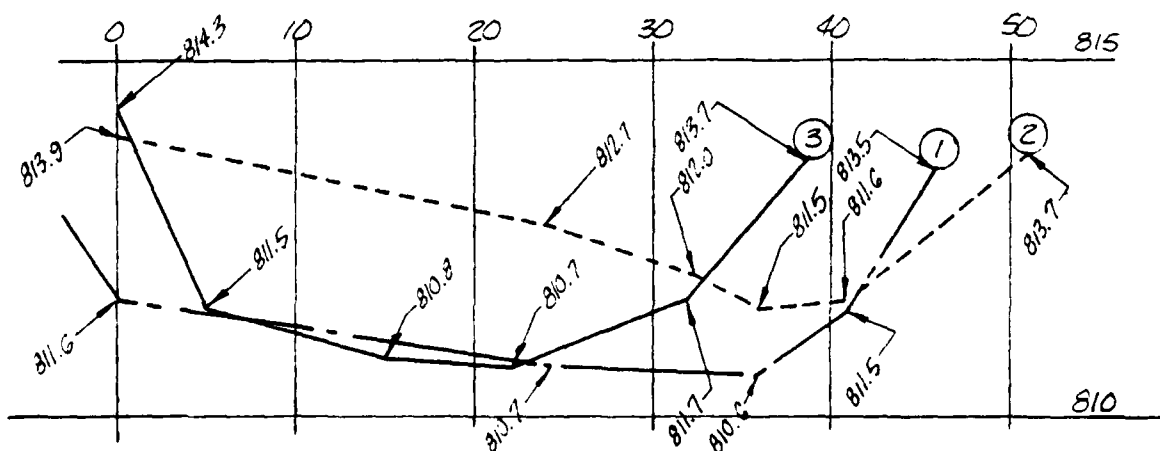




DAM SECTION @ STA. 3+70  
Scale: 1" = 20'



SPILLWAY PROFILE  
Scale: 1" = 40' H  
1" = 5' V



SPILLWAY SECTIONS  
Scale: 1" = 10' H  
1" = 2.5' V

APPENDIX D  
HYDRAULIC AND HYDROLOGIC DATA



## HYDROLOGIC COMPUTATIONS

1. The SCS dimensionless unit hydrograph and the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Corps of Engineers, Davis, California, were used to develop the inflow hydrographs.
  - a. Twenty-four hour, 10-year and 100-year rainfall for the dam location was taken from the data for the rainfall station at Sullivan, Missouri as supplied by the St. Louis District, Corps of Engineers per their letter dated 6 March 1979. The twenty-four hour probable maximum precipitation was taken from the curves of Hydrometeorological Report No. 33 and current Corps of Engineers and St. Louis District policy and guidance for hydraulics and hydrology.
  - b. Drainage area = 0.249 square miles (159.5 acres).
  - c. Time of concentration of runoff = 29 minutes (computed from "Kirpich" formula).
  - d. The antecedent storm conditions for the probable maximum precipitation were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMC III). The antecedent storm conditions for the 10-year and 100-year precipitation were an average of the conditions which have preceded the occurrence of the maximum annual flood on numerous watersheds (SCS AMC II). The initial pool elevation was assumed at the crest of the emergency spillway.
  - e. The total twenty-four hour storm duration losses for the 100-year storm were 1.53 inches. The total losses for the PMF storm were 0.62 inches. These data are based on SCS runoff curve No. 95 and No. 87 for antecedent moisture conditions, SCS AMC III and AMC II respectively. The watershed is composed of primarily SCS soil group D (Mexico-Armster-Putnam soil association) and consists mostly of alfalfa and grass with some cropland planted as row crops and some wooded areas.
  - f. Average soil loss rates = 0.05 inch per hour approximately.

2. The emergency spillway discharge rating curve was developed using the Corps of Engineers Water Surface Profile HEC-2 computer program. The flows over the dam crest were developed using the HEC-1 (Dam Safety Version) program with a discharge coefficient of 2.9 and a value of 1.5 for the exponent of head.
3. Floods were routed through the reservoir using the HEC-1 (Dam Safety Version) program to determine the capabilities of the spillway and dam embankment crest. The input, output, and plotted hydrographs are included in this Appendix.

# EASTERDAY DAM MISSOURI No. 10950

Elevation (M.S.L.)

814

813

812

811

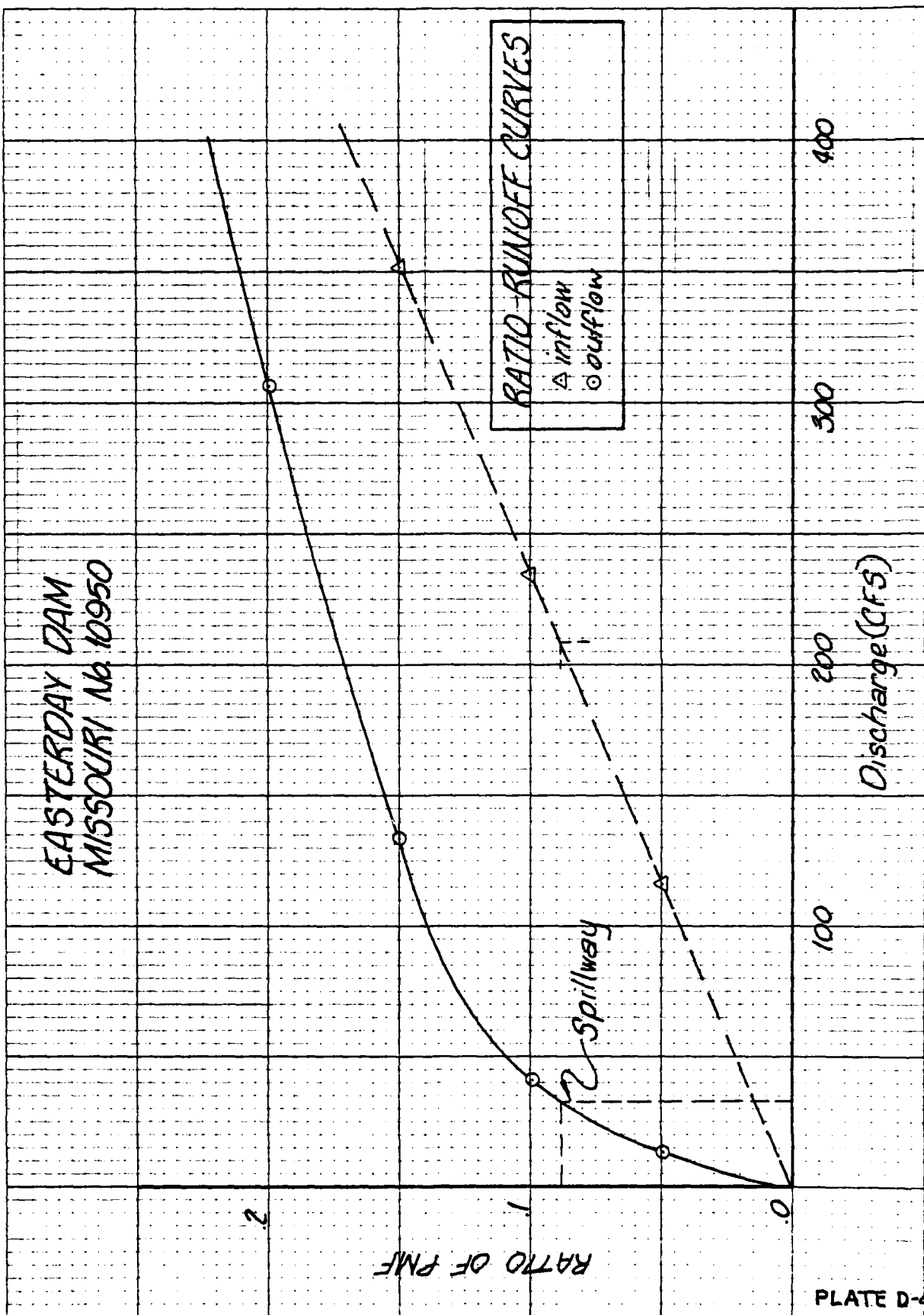
Spillway Rating  
Curve  
(HEC-2 Prog.)

Elev.	Disch.
811.6	0
812.1	10
812.5	26
813.0	62
813.5	124
814.0	220
814.5	355

50 100 150 200 250

Discharge in Cfs.

PLATE D-3





\*\*\*\*\*  
 FLOOD HYDROGRAPH PACKAGE (HEC-1)  
 DAM SAFETY VERSION JULY 1978  
 LAST MODIFICATION 26 FEB 79  
 \*\*\*\*\*

RUN DATE 79/08/14.  
 TIME 18.31.29.

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF  
 HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF PIERSON DAM 10950  
 RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

JOB SPECIFICATION

NQ	NHR	NMIN	IOAY	IHR	IMIN	METRC	IPLY	IPRT	NSTAN
288	0	5	0	0	0	0	0	3	0
JOPER 5									
NWT LROPT TRACE									
5 0 0 0									

MULTI-PLAN ANALYSES TO BE PERFORMED

RTIOS= .05 .10 .15 .20 .35 .50 .65 .80 1.00  
 MPLAN= 1 NRTIO= 9 LRTIO= 1

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF INFLO HYDRO TO RES 10950

ISTAQ	ICOMP	TECON	ITAPE	JPLY	JPRY	INAME	ISTAGE	IAUTO
000001	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

HYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISHOW	ISAME	LOCAL
1	2	.25	0.00	.25	1.00	0.000	0	1	0

PRECIP DATA

SPEE	P45	R6	R12	R24	R48	R72	R96
0.00	24.80	102.00	121.00	130.00	0.00	0.00	0.00

LOSS DATA

IRUPT	STRKR	DLTKR	RTIOL	ERAIN	STPKS	RTIOK	STRYL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-95.00	0.00	0.00

CURVE NO = -95.00 WETNESS = -1.00 EFFECT CN = 95.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= .29

RECESSION DATA

SIRTK= 0.00 QRCNS= -.01 K110R= 1.00

UNIT HYDROGRAPH 19 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .29 VOL= 1.00  
 51. 173. 320. 364. 325. 245. 153. 101. 69. 45.  
 30. 20. 13. 5. 6. 4. 3. 2. 1.

END-OF-PERIOD FLOW

0

STATION 000002, PLAN 1, RATIO 6 0.5 PMF

### END-OF-PERIOD HYDROGRAPH ORDINATES

[illegible]

PLATE D-7





CVF

STATION000002

INFLOW, OUTFLOW, AND OBSERVED FLOW

0.	200.	400.	600.	800.	1000.	1200.	0.	0.	0.	0.	0.	0.
.05	11	.	.	.	.	.	.	.	.	.	.	.
.10	21	.	.	.	.	.	.	.	.	.	.	.
.15	31	.	.	.	.	.	.	.	.	.	.	.
.20	41	.	.	.	.	.	.	.	.	.	.	.
.25	51	.	.	.	.	.	.	.	.	.	.	.
.30	61	.	.	.	.	.	.	.	.	.	.	.
.35	71	.	.	.	.	.	.	.	.	.	.	.
.40	81	.	.	.	.	.	.	.	.	.	.	.
.45	91	.	.	.	.	.	.	.	.	.	.	.
.50	101	.	.	.	.	.	.	.	.	.	.	.
.55	111	.	.	.	.	.	.	.	.	.	.	.
.60	121	.	.	.	.	.	.	.	.	.	.	.
.65	131	.	.	.	.	.	.	.	.	.	.	.
.70	141	.	.	.	.	.	.	.	.	.	.	.
.75	151	.	.	.	.	.	.	.	.	.	.	.
.80	161	.	.	.	.	.	.	.	.	.	.	.
.85	171	.	.	.	.	.	.	.	.	.	.	.
.90	181	.	.	.	.	.	.	.	.	.	.	.
.95	191	.	.	.	.	.	.	.	.	.	.	.
1.00	201	.	.	.	.	.	.	.	.	.	.	.
1.05	211	.	.	.	.	.	.	.	.	.	.	.
1.10	221	.	.	.	.	.	.	.	.	.	.	.
1.15	231	.	.	.	.	.	.	.	.	.	.	.
1.20	241	.	.	.	.	.	.	.	.	.	.	.
1.25	251	.	.	.	.	.	.	.	.	.	.	.
1.30	261	.	.	.	.	.	.	.	.	.	.	.
1.35	271	.	.	.	.	.	.	.	.	.	.	.
1.40	281	.	.	.	.	.	.	.	.	.	.	.
1.45	291	.	.	.	.	.	.	.	.	.	.	.
1.50	301	.	.	.	.	.	.	.	.	.	.	.
1.55	311	.	.	.	.	.	.	.	.	.	.	.
1.60	321	.	.	.	.	.	.	.	.	.	.	.
1.65	331	.	.	.	.	.	.	.	.	.	.	.
1.70	341	.	.	.	.	.	.	.	.	.	.	.
1.75	351	.	.	.	.	.	.	.	.	.	.	.
1.80	361	.	.	.	.	.	.	.	.	.	.	.
1.85	371	.	.	.	.	.	.	.	.	.	.	.
1.90	381	.	.	.	.	.	.	.	.	.	.	.
1.95	391	.	.	.	.	.	.	.	.	.	.	.
2.00	401	.	.	.	.	.	.	.	.	.	.	.
2.05	411	.	.	.	.	.	.	.	.	.	.	.
2.10	421	.	.	.	.	.	.	.	.	.	.	.
2.15	431	.	.	.	.	.	.	.	.	.	.	.
2.20	441	.	.	.	.	.	.	.	.	.	.	.
2.25	451	.	.	.	.	.	.	.	.	.	.	.
2.30	461	.	.	.	.	.	.	.	.	.	.	.
2.35	471	.	.	.	.	.	.	.	.	.	.	.
2.40	481	.	.	.	.	.	.	.	.	.	.	.
2.45	491	.	.	.	.	.	.	.	.	.	.	.
2.50	501	.	.	.	.	.	.	.	.	.	.	.
2.55	511	.	.	.	.	.	.	.	.	.	.	.
2.60	521	.	.	.	.	.	.	.	.	.	.	.
2.65	531	.	.	.	.	.	.	.	.	.	.	.
2.70	541	.	.	.	.	.	.	.	.	.	.	.
2.75	551	.	.	.	.	.	.	.	.	.	.	.
2.80	561	.	.	.	.	.	.	.	.	.	.	.
2.85	571	.	.	.	.	.	.	.	.	.	.	.
2.90	581	.	.	.	.	.	.	.	.	.	.	.
2.95	591	.	.	.	.	.	.	.	.	.	.	.
3.00	601	.	.	.	.	.	.	.	.	.	.	.
3.05	611	.	.	.	.	.	.	.	.	.	.	.
3.10	621	.	.	.	.	.	.	.	.	.	.	.
3.15	631	.	.	.	.	.	.	.	.	.	.	.
3.20	641	.	.	.	.	.	.	.	.	.	.	.
3.25	651	.	.	.	.	.	.	.	.	.	.	.
3.30	661	.	.	.	.	.	.	.	.	.	.	.
3.35	671	.	.	.	.	.	.	.	.	.	.	.
3.40	681	.	.	.	.	.	.	.	.	.	.	.
3.45	691	.	.	.	.	.	.	.	.	.	.	.
3.50	701	.	.	.	.	.	.	.	.	.	.	.
3.55	711	.	.	.	.	.	.	.	.	.	.	.
3.60	721	.	.	.	.	.	.	.	.	.	.	.
3.65	731	.	.	.	.	.	.	.	.	.	.	.
3.70	741	.	.	.	.	.	.	.	.	.	.	.
3.75	751	.	.	.	.	.	.	.	.	.	.	.
3.80	761	.	.	.	.	.	.	.	.	.	.	.
3.85	771	.	.	.	.	.	.	.	.	.	.	.
3.90	781	.	.	.	.	.	.	.	.	.	.	.
3.95	791	.	.	.	.	.	.	.	.	.	.	.
4.00	801	.	.	.	.	.	.	.	.	.	.	.
4.05	811	.	.	.	.	.	.	.	.	.	.	.
4.10	821	.	.	.	.	.	.	.	.	.	.	.
4.15	831	.	.	.	.	.	.	.	.	.	.	.
4.20	841	.	.	.	.	.	.	.	.	.	.	.
4.25	851	.	.	.	.	.	.	.	.	.	.	.
4.30	861	.	.	.	.	.	.	.	.	.	.	.
4.35	871	.	.	.	.	.	.	.	.	.	.	.
4.40	881	.	.	.	.	.	.	.	.	.	.	.
4.45	891	.	.	.	.	.	.	.	.	.	.	.
4.50	901	.	.	.	.	.	.	.	.	.	.	.









## AREA IN' SQUARE MILES ISQUARE KILOMETERS)

[illegible]

# SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

PLAN 1 .....							
ELEVATION		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM			
STORAGE		811.60	811.60	812.60			
OUTFLOW		77.	77.	102.			
		0.	0.	33.			
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.05	812.21	0.00	92.	14.	0.00	18.33	0.00
.10	812.71	.11	105.	41.	3.25	18.17	0.00
.15	813.01	.41	112.	134.	5.25	16.33	0.00
.20	813.17	.57	117.	307.	6.50	16.08	0.00
.35	813.43	.80	123.	667.	8.92	16.00	0.00
.50	813.57	.97	128.	995.	10.58	16.00	0.00
.65	813.70	1.10	132.	1325.	13.42	16.00	0.00
.80	813.82	1.22	135.	1654.	14.50	16.00	0.00
1.00	813.98	1.38	139.	2111.	15.25	15.92	0.00







LOSS DATA													
LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOL	STRIL	CNSTL	ALSMX	RTIMP			
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-87.00	0.00	0.00			
CURVE NO = -87.00 WETNESS = -1.00 EFFECT CN = 87.00													
UNIT HYDROGRAPH DATA													
TC= 0.00 LAG= .29													
RECESSION DATA													
STATQ= 0.00 QRCNSN= -.01 RTIOL= 1.00													
UNIT HYDROGRAPH 19 END OF PERIOD ORIGINATES, TC= 0.00 HOURS, LAG= .29 VOL= 1.00													
53.	173.	320.	364.	325.	245.	153.	101.	69.	45.				
30.	20.	13.	9.	6.	4.	3.	2.	1.					
END-OF-PERIOD FLOW													
MO.DA	HR.MM	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MM	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	05	1	.01	0.00	.01	0.	1.01	12.05	145	.59	.50	.09	219.
1.01	10	2	.01	0.00	.01	0.	1.01	12.10	146	.26	.23	.03	319.
1.01	15	3	.01	0.00	.01	0.	1.01	12.15	147	.16	.15	.02	414.
1.01	20	4	.01	0.00	.01	0.	1.01	12.20	148	.09	.08	.01	449.
1.01	25	5	.01	0.00	.01	0.	1.01	12.25	149	.09	.08	.01	427.
1.01	30	6	.01	0.00	.01	0.	1.01	12.30	150	.09	.08	.01	367.
1.01	35	7	.01	0.00	.01	0.	1.01	12.35	151	.05	.04	.00	298.
1.01	40	8	.01	0.00	.01	0.	1.01	12.40	152	.05	.04	.00	243.
1.01	45	9	.01	0.00	.01	0.	1.01	12.45	153	.05	.04	.00	199.
1.01	50	10	.01	0.00	.01	0.	1.01	12.50	154	.05	.04	.00	164.
1.01	55	11	.01	0.00	.01	0.	1.01	12.55	155	.05	.04	.00	139.
1.01	1.00	12	.01	0.00	.01	0.	1.01	13.00	156	.05	.04	.00	121.
1.01	1.05	13	.01	0.00	.01	0.	1.01	13.05	157	.03	.03	.00	109.
1.01	1.10	14	.01	0.00	.01	0.	1.01	13.10	158	.03	.03	.00	98.
1.01	1.15	15	.01	0.00	.01	0.	1.01	13.15	159	.03	.03	.00	88.
1.01	1.20	16	.01	0.00	.01	0.	1.01	13.20	160	.03	.03	.00	79.
1.01	1.25	17	.01	0.00	.01	0.	1.01	13.25	161	.03	.03	.00	71.
1.01	1.30	18	.01	0.00	.01	0.	1.01	13.30	162	.03	.03	.00	65.
1.01	1.35	19	.01	0.00	.01	0.	1.01	13.35	163	.02	.01	.00	61.
1.01	1.40	20	.01	0.00	.01	0.	1.01	13.40	164	.02	.01	.00	56.
1.01	1.45	21	.01	0.00	.01	0.	1.01	13.45	165	.02	.01	.00	50.
1.01	1.50	22	.01	0.00	.01	0.	1.01	13.50	166	.02	.01	.00	43.
1.01	1.55	23	.01	0.00	.01	0.	1.01	13.55	167	.02	.01	.00	38.
1.01	2.00	24	.01	0.00	.01	0.	1.01	14.00	168	.02	.01	.00	34.
1.01	2.05	25	.01	0.00	.01	0.	1.01	14.05	169	.02	.01	.00	32.
1.01	2.10	26	.01	0.00	.01	0.	1.01	14.10	170	.02	.01	.00	30.
1.01	2.15	27	.01	0.00	.01	0.	1.01	14.15	171	.02	.01	.00	29.
1.01	2.20	28	.01	0.00	.01	0.	1.01	14.20	172	.02	.01	.00	28.
1.01	2.25	29	.01	0.00	.01	0.	1.01	14.25	173	.02	.01	.00	27.
1.01	2.30	30	.01	0.00	.01	0.	1.01	14.30	174	.02	.01	.00	27.

1.01	2.35	31	.01	0.00	.01	0.	1.01	14.35	175	.02	.01	.00	27.
1.01	2.40	32	.01	0.00	.01	0.	1.01	14.40	176	.02	.01	.00	27.
1.01	2.45	33	.01	0.00	.01	0.	1.01	14.45	177	.02	.01	.00	27.
1.01	2.50	34	.01	0.00	.01	0.	1.01	14.50	178	.02	.01	.00	27.
1.01	2.55	35	.01	0.00	.01	0.	1.01	14.55	179	.02	.01	.00	27.
1.01	3.00	36	.01	0.00	.01	0.	1.01	15.00	180	.02	.01	.00	27.
1.01	3.05	37	.01	0.00	.01	0.	1.01	15.05	181	.01	.01	.00	27.
1.01	3.10	38	.01	0.00	.01	0.	1.01	15.10	182	.01	.01	.00	26.
1.01	3.15	39	.01	0.00	.01	0.	1.01	15.15	183	.01	.01	.00	24.
1.01	3.20	40	.01	0.00	.01	0.	1.01	15.20	184	.01	.01	.00	23.
1.01	3.25	41	.01	0.00	.01	0.	1.01	15.25	185	.01	.01	.00	21.
1.01	3.30	42	.01	0.00	.01	0.	1.01	15.30	186	.01	.01	.00	20.
1.01	3.35	43	.01	0.00	.01	0.	1.01	15.35	187	.01	.01	.00	19.
1.01	3.40	44	.01	0.00	.01	0.	1.01	15.40	188	.01	.01	.00	19.
1.01	3.45	45	.01	0.00	.01	0.	1.01	15.45	189	.01	.01	.00	19.
1.01	3.50	46	.01	0.00	.01	0.	1.01	15.50	190	.01	.01	.00	18.
1.01	3.55	47	.01	0.00	.01	0.	1.01	15.55	191	.01	.01	.00	18.
1.01	4.00	48	.01	0.00	.01	0.	1.01	16.00	192	.01	.01	.00	18.
1.01	4.05	49	.01	0.00	.01	0.	1.01	16.05	193	.01	.01	.00	18.
1.01	4.10	50	.01	0.00	.01	0.	1.01	16.10	194	.01	.01	.00	18.
1.01	4.15	51	.01	0.00	.01	0.	1.01	16.15	195	.01	.01	.00	18.
1.01	4.20	52	.01	0.00	.01	0.	1.01	16.20	196	.01	.01	.00	18.
1.01	4.25	53	.01	0.00	.01	0.	1.01	16.25	197	.01	.01	.00	18.
1.01	4.30	54	.01	0.00	.01	0.	1.01	16.30	198	.01	.01	.00	18.
1.01	4.35	55	.01	0.00	.01	0.	1.01	16.35	199	.01	.01	.00	18.
1.01	4.40	56	.01	0.00	.01	0.	1.01	16.40	200	.01	.01	.00	18.
1.01	4.45	57	.01	0.00	.01	0.	1.01	16.45	201	.01	.01	.00	18.
1.01	4.50	58	.01	0.00	.01	0.	1.01	16.50	202	.01	.01	.00	18.
1.01	4.55	59	.01	0.00	.01	0.	1.01	16.55	203	.01	.01	.00	18.
1.01	5.00	60	.01	0.00	.00	0.	1.01	17.00	204	.01	.01	.00	18.
1.01	5.05	61	.01	0.00	.00	0.	1.01	17.05	205	.01	.01	.00	18.
1.01	5.10	62	.01	0.00	.00	0.	1.01	17.10	206	.01	.01	.00	18.
1.01	5.15	63	.01	0.00	.00	0.	1.01	17.15	207	.01	.01	.00	18.
1.01	5.20	64	.01	0.00	.00	0.	1.01	17.20	208	.01	.01	.00	18.
1.01	5.25	65	.01	0.00	.00	0.	1.01	17.25	209	.01	.01	.00	18.
1.01	5.30	66	.01	0.00	.00	0.	1.01	17.30	210	.01	.01	.00	18.
1.01	5.35	67	.01	0.00	.00	0.	1.01	17.35	211	.01	.01	.00	18.
1.01	5.40	68	.01	0.00	.00	0.	1.01	17.40	212	.01	.01	.00	18.
1.01	5.45	69	.01	0.00	.00	0.	1.01	17.45	213	.01	.01	.00	18.
1.01	5.50	70	.01	0.00	.00	0.	1.01	17.50	214	.01	.01	.00	18.
1.01	5.55	71	.01	0.00	.00	0.	1.01	17.55	215	.01	.01	.00	18.
1.01	6.00	72	.01	0.00	.00	0.	1.01	18.00	216	.01	.01	.00	18.
1.01	6.05	73	.01	0.00	.01	1.	1.01	18.05	217	.01	.00	.00	18.
1.01	6.10	74	.01	0.00	.01	1.	1.01	18.10	218	.01	.00	.00	17.
1.01	6.15	75	.01	0.00	.01	1.	1.01	18.15	219	.01	.00	.00	16.
1.01	6.20	76	.01	0.00	.01	1.	1.01	18.20	220	.01	.00	.00	14.
1.01	6.25	77	.01	0.00	.01	1.	1.01	18.25	221	.01	.00	.00	12.
1.01	6.30	78	.01	0.00	.01	2.	1.01	18.30	222	.01	.00	.00	11.
1.01	6.35	79	.01	0.00	.01	2.	1.01	18.35	223	.01	.00	.00	10.
1.01	6.40	80	.01	0.00	.01	3.	1.01	18.40	224	.01	.00	.00	10.
1.01	6.45	81	.01	0.00	.01	2.	1.01	18.45	225	.01	.00	.00	10.
1.01	6.50	82	.01	0.00	.01	3.	1.01	18.50	226	.01	.00	.00	9.
1.01	6.55	83	.01	0.00	.01	3.	1.01	18.55	227	.01	.00	.00	9.
1.01	7.00	84	.01	0.00	.01	3.	1.01	19.00	228	.01	.00	.00	9.
1.01	7.05	85	.01	0.00	.01	3.	1.01	19.05	229	.01	.00	.00	9.
1.01	7.10	86	.01	0.00	.01	3.	1.01	19.10	230	.01	.00	.00	9.
1.01	7.15	87	.01	0.00	.01	4.	1.01	19.15	231	.01	.00	.00	9.
1.01	7.20	88	.01	0.00	.01	4.	1.01	19.20	232	.01	.00	.00	9.
1.01	7.25	89	.01	0.00	.01	4.	1.01	19.25	233	.01	.00	.00	9.
1.01	7.30	90	.01	0.00	.01	4.	1.01	19.30	234	.01	.00	.00	9.
1.01	7.35	91	.01	0.00	.01	4.	1.01	19.35	235	.01	.00	.00	9.
1.01	7.40	92	.01	0.00	.01	5.	1.01	19.40	236	.01	.00	.00	9.

1.01	7.45	93	.01	.00	.01	.01	.00	.01	.01	5.	1.01	19.45	237	.01	.00	.00	9.
1.01	7.50	94	.01	.00	.01	.01	.00	.01	.01	5.	1.01	19.50	238	.01	.00	.00	9.
1.01	7.55	95	.01	.00	.01	.01	.00	.01	.01	5.	1.01	19.55	239	.01	.00	.00	9.
1.01	8.00	96	.01	.00	.01	.01	.00	.01	.01	5.	1.01	20.00	240	.01	.00	.00	9.
1.01	8.05	97	.01	.00	.01	.01	.00	.01	.01	5.	1.01	20.05	241	.01	.00	.00	9.
1.01	8.10	98	.01	.00	.01	.01	.00	.01	.01	6.	1.01	20.10	242	.01	.00	.00	9.
1.01	8.15	99	.01	.00	.01	.01	.00	.01	.01	6.	1.01	20.15	243	.01	.00	.00	9.
1.01	8.20	100	.01	.00	.01	.01	.00	.01	.01	6.	1.01	20.20	244	.01	.00	.00	9.
1.01	8.25	101	.01	.00	.01	.01	.00	.01	.01	6.	1.01	20.25	245	.01	.00	.00	9.
1.01	8.30	102	.01	.00	.01	.01	.00	.01	.01	6.	1.01	20.30	246	.01	.00	.00	9.
1.01	8.35	103	.01	.00	.01	.01	.00	.01	.01	6.	1.01	20.35	247	.01	.00	.00	9.
1.01	8.40	104	.01	.00	.01	.01	.00	.01	.01	6.	1.01	20.40	248	.01	.00	.00	9.
1.01	8.45	105	.01	.00	.01	.01	.00	.01	.01	7.	1.01	20.45	249	.01	.00	.00	9.
1.01	8.50	106	.01	.00	.01	.01	.00	.01	.01	7.	1.01	20.50	250	.01	.00	.00	9.
1.01	8.55	107	.01	.00	.01	.01	.00	.01	.01	7.	1.01	20.55	251	.01	.00	.00	9.
1.01	9.00	108	.01	.00	.01	.01	.00	.01	.01	7.	1.01	21.00	252	.01	.00	.00	9.
1.01	9.05	109	.02	.01	.01	.01	.00	.01	.01	7.	1.01	21.05	253	.01	.00	.00	9.
1.01	9.10	110	.02	.01	.01	.01	.00	.01	.01	8.	1.01	21.10	254	.01	.00	.00	9.
1.01	9.15	111	.02	.01	.01	.01	.00	.01	.01	8.	1.01	21.15	255	.01	.00	.00	9.
1.01	9.20	112	.02	.01	.01	.01	.00	.01	.01	9.	1.01	21.20	256	.01	.00	.00	9.
1.01	9.25	113	.02	.01	.01	.01	.00	.01	.01	10.	1.01	21.25	257	.01	.00	.00	9.
1.01	9.30	114	.02	.01	.01	.01	.00	.01	.01	11.	1.01	21.30	258	.01	.00	.00	9.
1.01	9.35	115	.02	.01	.01	.01	.00	.01	.01	11.	1.01	21.35	259	.01	.00	.00	9.
1.01	9.40	116	.02	.01	.01	.01	.00	.01	.01	12.	1.01	21.40	260	.01	.00	.00	9.
1.01	9.45	117	.02	.01	.01	.01	.00	.01	.01	12.	1.01	21.45	261	.01	.00	.00	9.
1.01	9.50	118	.02	.01	.01	.01	.00	.01	.01	13.	1.01	21.50	262	.01	.00	.00	9.
1.01	9.55	119	.02	.01	.01	.01	.00	.01	.01	13.	1.01	21.55	263	.01	.00	.00	9.
1.01	10.00	120	.02	.01	.01	.01	.00	.01	.01	13.	1.01	22.00	264	.01	.00	.00	9.
1.01	10.05	121	.02	.01	.01	.01	.00	.01	.01	13.	1.01	22.05	265	.01	.00	.00	9.
1.01	10.10	122	.02	.01	.01	.01	.00	.01	.01	14.	1.01	22.10	266	.01	.00	.00	9.
1.01	10.15	123	.02	.01	.01	.01	.00	.01	.01	14.	1.01	22.15	267	.01	.00	.00	9.
1.01	10.20	124	.02	.01	.01	.01	.00	.01	.01	14.	1.01	22.20	268	.01	.00	.00	9.
1.01	10.25	125	.02	.01	.01	.01	.00	.01	.01	14.	1.01	22.25	269	.01	.00	.00	9.
1.01	10.30	126	.02	.01	.01	.01	.00	.01	.01	15.	1.01	22.30	270	.01	.00	.00	9.
1.01	10.35	127	.03	.02	.01	.01	.00	.01	.01	15.	1.01	22.35	271	.01	.00	.00	9.
1.01	10.40	128	.03	.02	.01	.01	.00	.01	.01	17.	1.01	22.40	272	.01	.00	.00	9.
1.01	10.45	129	.03	.02	.01	.01	.00	.01	.01	20.	1.01	22.45	273	.01	.00	.00	9.
1.01	10.50	130	.03	.02	.01	.01	.00	.01	.01	23.	1.01	22.50	274	.01	.00	.00	9.
1.01	10.55	131	.03	.02	.01	.01	.00	.01	.01	27.	1.01	22.55	275	.01	.00	.00	9.
1.01	11.00	132	.03	.02	.01	.01	.00	.01	.01	29.	1.01	23.00	276	.01	.00	.00	9.
1.01	11.05	133	.05	.03	.02	.01	.00	.01	.01	32.	1.01	23.05	277	.01	.00	.00	9.
1.01	11.10	134	.05	.03	.02	.01	.00	.01	.01	35.	1.01	23.10	278	.01	.00	.00	9.
1.01	11.15	135	.05	.03	.02	.01	.00	.01	.01	40.	1.01	23.15	279	.01	.00	.00	9.
1.01	11.20	136	.05	.03	.02	.01	.00	.01	.01	45.	1.01	23.20	280	.01	.00	.00	9.
1.01	11.25	137	.05	.03	.02	.01	.00	.01	.01	50.	1.01	23.25	281	.01	.00	.00	9.
1.01	11.30	138	.05	.03	.02	.01	.00	.01	.01	54.	1.01	23.30	282	.01	.00	.00	9.
1.01	11.35	139	.09	.06	.03	.02	.00	.01	.01	59.	1.01	23.35	283	.01	.00	.00	9.
1.01	11.40	140	.09	.06	.02	.01	.00	.01	.01	65.	1.01	23.40	284	.01	.00	.00	9.
1.01	11.45	141	.09	.06	.02	.01	.00	.01	.01	76.	1.01	23.45	285	.01	.00	.00	9.
1.01	11.50	142	.16	.12	.04	.01	.00	.01	.01	91.	1.01	23.50	286	.01	.00	.00	9.
1.01	11.55	143	.16	.13	.04	.01	.00	.01	.01	112.	1.01	23.55	287	.01	.00	.00	9.
1.01	12.00	144	.38	.31	.07	.01	.00	.01	.01	149.	1.02	0.00	288	.01	.00	.00	9.

SUM 5.17 3.72 1.44 7154.  
( 131.11 95.11 37.11 202.581

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
449.	80.	25.	25.	7163.
13.	2.	1.	1.	203.
	2.99	3.70	3.70	3.70
	76.02	94.03	94.03	94.03
	40.	49.	49.	49.

•OVN•

HYDROGRAPH AT STAD00001 FOR PLAN 1, RATIO 1

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
449.	80.	25.	25.	7183.
CFS				
13.	2.	1.	1.	203.
INCHES				
	2.99	3.70	3.70	
MM				
	76.02	94.03	94.03	94.03
AC-FT				
	40.	49.	49.	49.
THOUS CU M				
	49.	61.	61.	61.

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

\*\*\*\*\*

HYDROGRAPH ROUTING

ROUTED FLOWS THRU RES 10950

ISTAQ	ICOMP	TECON	ITYPE	JPLY	JPRY	INAME	ISTAGE	TAUTO
000002	1	0	0	2	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRCS	ISAME	LOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	YSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-812.	-1

STAGE	811.60	812.10	812.50	813.00	813.50	814.00	814.50
FLOW	0.00	10.00	26.00	62.00	124.00	220.00	355.00

CAPACITY=	0.	39.	61.	87.	112.	140.	170.
-----------	----	-----	-----	-----	------	------	------

ELEVATION=	808.	810.	811.	812.	813.	814.	815.
------------	------	------	------	------	------	------	------

CREL	SPWID	CDQM	EXPW	ELEV	COQL	CAREA	EXPL
811.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
812.6	2.9	1.5	680.

CREST LENGTH	100.	440.	550.	660.	680.
--------------	------	------	------	------	------

AT OR BELOW ELEVATION	812.8	813.0	813.4	813.7	814.0
-----------------------	-------	-------	-------	-------	-------

STATION 000002, PLAN 1, RATIO 1

MO.DA	HR.MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	05	1	08	0.	0.	77.	811.6
1.01	10	2	17	0.	0.	77.	811.6
1.01	15	3	25	0.	0.	77.	811.6
1.01	20	4	33	0.	0.	77.	811.6
1.01	25	5	42	0.	0.	77.	811.6
1.01	30	6	50	0.	0.	77.	811.6
1.01	35	7	58	0.	0.	77.	811.6

1.01	1.40	8	67	0.	0.	0.	77.	811.6
1.01	1.45	9	75	0.	0.	0.	77.	811.6
1.01	1.50	10	83	0.	0.	0.	77.	811.6
1.01	1.55	11	92	0.	0.	0.	77.	811.6
1.01	1.60	12	100	0.	0.	0.	77.	811.6
1.01	1.65	13	108	0.	0.	0.	77.	811.6
1.01	1.70	14	117	0.	0.	0.	77.	811.6
1.01	1.75	15	125	0.	0.	0.	77.	811.6
1.01	1.80	16	133	0.	0.	0.	77.	811.6
1.01	1.85	17	142	0.	0.	0.	77.	811.6
1.01	1.90	18	150	0.	0.	0.	77.	811.6
1.01	1.95	19	158	0.	0.	0.	77.	811.6
1.01	2.00	20	167	0.	0.	0.	77.	811.6
1.01	2.05	21	175	0.	0.	0.	77.	811.6
1.01	2.10	22	183	0.	0.	0.	77.	811.6
1.01	2.15	23	192	0.	0.	0.	77.	811.6
1.01	2.20	24	200	0.	0.	0.	77.	811.6
1.01	2.25	25	208	0.	0.	0.	77.	811.6
1.01	2.30	26	217	0.	0.	0.	77.	811.6
1.01	2.35	27	225	0.	0.	0.	77.	811.6
1.01	2.40	28	233	0.	0.	0.	77.	811.6
1.01	2.45	29	242	0.	0.	0.	77.	811.6
1.01	2.50	30	250	0.	0.	0.	77.	811.6
1.01	2.55	31	258	0.	0.	0.	77.	811.6
1.01	2.60	32	267	0.	0.	0.	77.	811.6
1.01	2.65	33	275	0.	0.	0.	77.	811.6
1.01	2.70	34	283	0.	0.	0.	77.	811.6
1.01	2.75	35	292	0.	0.	0.	77.	811.6
1.01	2.80	36	300	0.	0.	0.	77.	811.6
1.01	2.85	37	308	0.	0.	0.	77.	811.6
1.01	2.90	38	317	0.	0.	0.	77.	811.6
1.01	2.95	39	325	0.	0.	0.	77.	811.6
1.01	3.00	40	333	0.	0.	0.	77.	811.6
1.01	3.05	41	342	0.	0.	0.	77.	811.6
1.01	3.10	42	350	0.	0.	0.	77.	811.6
1.01	3.15	43	358	0.	0.	0.	77.	811.6
1.01	3.20	44	367	0.	0.	0.	77.	811.6
1.01	3.25	45	375	0.	0.	0.	77.	811.6
1.01	3.30	46	383	0.	0.	0.	77.	811.6
1.01	3.35	47	392	0.	0.	0.	77.	811.6
1.01	3.40	48	400	0.	0.	0.	77.	811.6
1.01	3.45	49	408	0.	0.	0.	77.	811.6
1.01	3.50	50	417	0.	0.	0.	77.	811.6
1.01	3.55	51	425	0.	0.	0.	77.	811.6
1.01	3.60	52	433	0.	0.	0.	77.	811.6
1.01	3.65	53	442	0.	0.	0.	77.	811.6
1.01	3.70	54	450	0.	0.	0.	77.	811.6
1.01	3.75	55	458	0.	0.	0.	77.	811.6
1.01	3.80	56	467	0.	0.	0.	77.	811.6
1.01	3.85	57	475	0.	0.	0.	77.	811.6
1.01	3.90	58	483	0.	0.	0.	77.	811.6
1.01	3.95	59	492	0.	0.	0.	77.	811.6
1.01	4.00	60	500	0.	0.	0.	77.	811.6
1.01	4.05	61	508	0.	0.	0.	77.	811.6
1.01	4.10	62	517	0.	0.	0.	77.	811.6
1.01	4.15	63	525	0.	0.	0.	77.	811.6
1.01	4.20	64	533	0.	0.	0.	77.	811.6
1.01	4.25	65	542	0.	0.	0.	77.	811.6
1.01	4.30	66	550	0.	0.	0.	77.	811.6
1.01	4.35	67	558	0.	0.	0.	77.	811.6
1.01	4.40	68	567	0.	0.	0.	77.	811.6
1.01	4.45	69	575	0.	0.	0.	77.	811.6
1.01	4.50	70	583	0.	0.	0.	77.	811.6
1.01	4.55	71	592	0.	0.	0.	77.	811.6
1.01	4.60	72	600	0.	0.	0.	77.	811.6
1.01	4.65	73	608	0.	0.	0.	77.	811.6
1.01	4.70	74	617	0.	0.	0.	77.	811.6
1.01	4.75	75	625	0.	0.	0.	77.	811.6
1.01	4.80	76	633	0.	0.	0.	77.	811.6
1.01	4.85	77	642	0.	0.	0.	77.	811.6
1.01	4.90	78	650	0.	0.	0.	77.	811.6
1.01	4.95	79	658	0.	0.	0.	77.	811.6
1.01	5.00	80	667	0.	0.	0.	77.	811.6
1.01	5.05	81	675	0.	0.	0.	77.	811.6
1.01	5.10	82	683	0.	0.	0.	77.	811.6
1.01	5.15	83	692	0.	0.	0.	77.	811.6
1.01	5.20	84	700	0.	0.	0.	77.	811.6
1.01	5.25	85	708	0.	0.	0.	77.	811.6
1.01	5.30	86	717	0.	0.	0.	77.	811.6
1.01	5.35	87	725	0.	0.	0.	77.	811.6
1.01	5.40	88	733	0.	0.	0.	77.	811.6
1.01	5.45	89	742	0.	0.	0.	77.	811.6

1.01	5.50	70	5.83	0.	0.	77.	811.6
1.01	5.55	71	5.92	0.	0.	77.	811.6
1.01	6.00	72	6.00	0.	0.	77.	811.6
1.01	6.05	73	6.08	1.	0.	77.	811.6
1.01	6.10	74	6.17	1.	0.	77.	811.6
1.01	6.15	75	6.25	1.	0.	77.	811.6
1.01	6.20	76	6.33	1.	0.	77.	811.6
1.01	6.25	77	6.42	1.	0.	77.	811.6
1.01	6.30	78	6.50	2.	0.	77.	811.6
1.01	6.35	79	6.58	2.	0.	77.	811.6
1.01	6.40	80	6.67	2.	0.	77.	811.6
1.01	6.45	81	6.75	2.	0.	77.	811.6
1.01	6.50	82	6.83	3.	0.	77.	811.6
1.01	6.55	83	6.92	3.	0.	77.	811.6
1.01	7.00	84	7.00	3.	0.	77.	811.6
1.01	7.05	85	7.08	3.	0.	77.	811.6
1.01	7.10	86	7.17	3.	0.	77.	811.6
1.01	7.15	87	7.25	4.	0.	77.	811.6
1.01	7.20	88	7.33	4.	0.	77.	811.6
1.01	7.25	89	7.42	4.	0.	77.	811.6
1.01	7.30	90	7.50	4.	0.	77.	811.6
1.01	7.35	91	7.58	4.	0.	77.	811.6
1.01	7.40	92	7.67	5.	0.	77.	811.6
1.01	7.45	93	7.75	5.	0.	77.	811.6
1.01	7.50	94	7.83	5.	0.	77.	811.6
1.01	7.55	95	7.92	5.	0.	77.	811.6
1.01	8.00	96	8.00	5.	0.	77.	811.6
1.01	8.05	97	8.08	5.	0.	77.	811.6
1.01	8.10	98	8.17	6.	0.	77.	811.6
1.01	8.15	99	8.25	6.	0.	77.	811.6
1.01	8.20	100	8.33	6.	0.	77.	811.6
1.01	8.25	101	8.42	6.	1.	77.	811.6
1.01	8.30	102	8.50	6.	1.	77.	811.6
1.01	8.35	103	8.58	6.	1.	77.	811.6
1.01	8.40	104	8.67	6.	1.	77.	811.6
1.01	8.45	105	8.75	7.	1.	77.	811.6
1.01	8.50	106	8.83	7.	1.	77.	811.6
1.01	8.55	107	8.92	7.	1.	77.	811.6
1.01	9.00	108	9.00	7.	1.	78.	811.6
1.01	9.05	109	9.08	7.	1.	78.	811.6
1.01	9.10	110	9.17	8.	1.	78.	811.6
1.01	9.15	111	9.25	8.	1.	78.	811.6
1.01	9.20	112	9.33	9.	1.	78.	811.6
1.01	9.25	113	9.42	10.	1.	78.	811.6
1.01	9.30	114	9.50	11.	1.	78.	811.6
1.01	9.35	115	9.58	11.	1.	78.	811.6
1.01	9.40	116	9.67	12.	1.	78.	811.7
1.01	9.45	117	9.75	12.	1.	78.	811.7
1.01	9.50	118	9.83	13.	1.	78.	811.7
1.01	9.55	119	9.92	13.	1.	78.	811.7
1.01	10.00	120	10.00	13.	1.	78.	811.7
1.01	10.05	121	10.08	13.	1.	78.	811.7
1.01	10.10	122	10.17	14.	1.	78.	811.7
1.01	10.15	123	10.25	14.	2.	79.	811.7
1.01	10.20	124	10.33	14.	2.	79.	811.7
1.01	10.25	125	10.42	15.	2.	79.	811.7
1.01	10.30	126	10.50	15.	2.	79.	811.7
1.01	10.35	127	10.58	15.	2.	79.	811.7
1.01	10.40	128	10.67	17.	2.	79.	811.7
1.01	10.45	129	10.75	20.	2.	79.	811.7
1.01	10.50	130	10.83	23.	2.	79.	811.7
1.01	10.55	131	10.92	27.	2.	79.	811.7

1.01	11.00	132	11.00	29.	2.	80.	811.7
1.01	11.05	133	11.08	32.	2.	80.	811.7
1.01	11.10	134	11.17	35.	3.	80.	811.7
1.01	11.15	135	11.25	40.	3.	80.	811.7
1.01	11.20	136	11.33	43.	3.	81.	811.8
1.01	11.25	137	11.42	50.	3.	81.	811.8
1.01	11.30	138	11.50	54.	4.	81.	811.8
1.01	11.35	139	11.58	59.	4.	82.	811.8
1.01	11.40	140	12.07	65.	4.	82.	811.8
1.01	11.45	141	12.15	76.	4.	82.	811.8
1.01	11.50	142	12.23	91.	5.	83.	811.8
1.01	11.55	143	12.31	112.	5.	84.	811.9
1.01	12.00	144	12.40	149.	6.	84.	811.9
1.01	12.05	145	12.48	219.	7.	85.	811.9
1.01	12.10	146	12.56	319.	8.	87.	812.0
1.01	12.15	147	13.04	414.	11.	90.	812.1
1.01	12.20	148	13.12	449.	15.	93.	812.2
1.01	12.25	149	13.20	427.	20.	96.	812.3
1.01	12.30	150	13.28	367.	24.	98.	812.5
1.01	12.35	151	13.36	298.	29.	100.	812.5
1.01	12.40	152	13.44	243.	33.	102.	812.6
1.01	12.45	153	13.52	199.	37.	103.	812.7
1.01	12.50	154	14.00	164.	40.	104.	812.7
1.01	12.55	155	14.08	139.	42.	105.	812.7
1.01	13.00	156	14.16	121.	44.	106.	812.7
1.01	13.05	157	14.24	109.	45.	106.	812.8
1.01	13.10	158	14.32	98.	46.	106.	812.8
1.01	13.15	159	14.40	88.	47.	107.	812.8
1.01	13.20	160	14.48	79.	48.	107.	812.8
1.01	13.25	161	14.56	71.	48.	107.	812.8
1.01	13.30	162	15.04	65.	49.	107.	812.8
1.01	13.35	163	15.12	61.	49.	107.	812.8
1.01	13.40	164	15.20	56.	50.	107.	812.8
1.01	13.45	165	15.28	50.	50.	107.	812.8
1.01	13.50	166	15.36	43.	50.	107.	812.8
1.01	13.55	167	15.44	38.	49.	107.	812.8
1.01	14.00	168	15.52	34.	49.	107.	812.8
1.01	14.05	169	16.00	32.	48.	107.	812.8
1.01	14.10	170	16.08	30.	48.	107.	812.8
1.01	14.15	171	16.16	29.	47.	107.	812.8
1.01	14.20	172	16.24	28.	47.	107.	812.8
1.01	14.25	173	16.32	28.	47.	107.	812.8
1.01	14.30	174	16.40	27.	46.	107.	812.8
1.01	14.35	175	16.48	27.	46.	106.	812.8
1.01	14.40	176	16.56	27.	46.	106.	812.8
1.01	14.45	177	17.04	27.	45.	106.	812.8
1.01	14.50	178	17.12	27.	45.	106.	812.8
1.01	14.55	179	17.20	27.	45.	106.	812.8
1.01	15.00	180	17.28	27.	44.	106.	812.8
1.01	15.05	181	17.36	27.	44.	106.	812.8
1.01	15.10	182	17.44	26.	44.	106.	812.7
1.01	15.15	183	17.52	24.	43.	106.	812.7
1.01	15.20	184	18.00	23.	43.	105.	812.7
1.01	15.25	185	18.08	21.	43.	105.	812.7
1.01	15.30	186	18.16	20.	42.	105.	812.7
1.01	15.35	187	18.24	19.	42.	105.	812.7
1.01	15.40	188	18.32	19.	41.	105.	812.7
1.01	15.45	189	18.40	19.	41.	105.	812.7
1.01	15.50	190	18.48	18.	40.	105.	812.7
1.01	15.55	191	18.56	18.	40.	104.	812.7
1.01	16.00	192	19.04	18.	40.	104.	812.7
1.01	16.05	193	19.12	18.	39.	104.	812.7



1.01	16.10	194	16.17	18.	39.	104.	812.7
1.01	16.15	195	16.25	18.	38.	104.	812.7
1.01	16.20	196	16.33	18.	38.	104.	812.7
1.01	16.25	197	16.42	18.	37.	103.	812.7
1.01	16.30	198	16.50	18.	37.	103.	812.7
1.01	16.35	199	16.58	18.	37.	103.	812.6
1.01	16.40	200	16.67	18.	36.	103.	812.6
1.01	16.45	201	16.75	18.	36.	103.	812.6
1.01	16.50	202	16.83	18.	36.	103.	812.6
1.01	16.55	203	16.92	18.	35.	103.	812.6
1.01	17.00	204	17.00	18.	35.	103.	812.6
1.01	17.05	205	17.08	18.	35.	102.	812.6
1.01	17.10	206	17.17	18.	34.	102.	812.6
1.01	17.15	207	17.25	18.	34.	102.	812.6
1.01	17.20	208	17.33	18.	34.	102.	812.6
1.01	17.25	209	17.42	18.	33.	102.	812.6
1.01	17.30	210	17.50	18.	33.	102.	812.6
1.01	17.35	211	17.58	18.	33.	102.	812.6
1.01	17.40	212	17.67	18.	33.	102.	812.6
1.01	17.45	213	17.75	18.	32.	102.	812.6
1.01	17.50	214	17.83	18.	32.	102.	812.6
1.01	17.55	215	17.92	18.	32.	102.	812.6
1.01	18.00	216	18.00	18.	31.	101.	812.6
1.01	18.05	217	18.08	18.	31.	101.	812.6
1.01	18.10	218	18.17	17.	31.	101.	812.6
1.01	18.15	219	18.25	16.	31.	101.	812.6
1.01	18.20	220	18.33	14.	31.	101.	812.6
1.01	18.25	221	18.42	12.	30.	101.	812.6
1.01	18.30	222	18.50	11.	30.	101.	812.6
1.01	18.35	223	18.58	10.	30.	101.	812.5
1.01	18.40	224	18.67	10.	29.	101.	812.5
1.01	18.45	225	18.75	10.	29.	100.	812.5
1.01	18.50	226	18.83	9.	28.	100.	812.5
1.01	18.55	227	18.92	9.	28.	100.	812.5
1.01	19.00	228	19.00	9.	28.	100.	812.5
1.01	19.05	229	19.08	9.	27.	100.	812.5
1.01	19.10	230	19.17	9.	27.	100.	812.5
1.01	19.15	231	19.25	9.	27.	100.	812.5
1.01	19.20	232	19.33	9.	26.	99.	812.5
1.01	19.25	233	19.42	9.	26.	99.	812.5
1.01	19.30	234	19.50	9.	26.	99.	812.5
1.01	19.35	235	19.58	9.	25.	99.	812.5
1.01	19.40	236	19.67	9.	25.	99.	812.5
1.01	19.45	237	19.75	9.	25.	99.	812.5
1.01	19.50	238	19.83	9.	25.	99.	812.5
1.01	19.55	239	19.92	9.	25.	99.	812.5
1.01	20.00	240	20.00	9.	25.	99.	812.5
1.01	20.05	241	20.08	9.	25.	99.	812.5
1.01	20.10	242	20.17	9.	24.	99.	812.5
1.01	20.15	243	20.25	9.	24.	98.	812.5
1.01	20.20	244	20.33	9.	24.	98.	812.5
1.01	20.25	245	20.42	9.	24.	98.	812.4
1.01	20.30	246	20.50	9.	24.	98.	812.4
1.01	20.35	247	20.58	9.	24.	98.	812.4
1.01	20.40	248	20.67	9.	23.	98.	812.4
1.01	20.45	249	20.75	9.	23.	98.	812.4
1.01	20.50	250	20.83	9.	23.	98.	812.4
1.01	20.55	251	20.92	9.	23.	98.	812.4
1.01	21.00	252	21.00	9.	23.	98.	812.4
1.01	21.05	253	21.08	9.	23.	97.	812.4
1.01	21.10	254	21.17	9.	23.	97.	812.4
1.01	21.15	255	21.25	9.	22.	97.	812.4

PEAK OUTFLOW TS										50. AT TIME 13.75 HOURS									
CFS CMS INCHES AC-FT THOUS CU M	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	21.20	256	21.33	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	21.25	257	21.42	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	21.30	258	21.50	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	21.35	259	21.58	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	21.40	260	21.67	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	21.45	261	21.75	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	21.50	262	21.83	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	21.55	263	21.92	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.00	264	22.00	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.05	265	22.08	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.10	266	22.17	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.15	267	22.25	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.20	268	22.33	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.25	269	22.42	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.30	270	22.50	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.35	271	22.58	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.40	272	22.67	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.45	273	22.75	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.50	274	22.83	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	22.55	275	22.92	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.00	276	23.00	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.05	277	23.08	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.10	278	23.17	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.15	279	23.25	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.20	280	23.33	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.25	281	23.42	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.30	282	23.50	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.35	283	23.58	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.40	284	23.67	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.45	285	23.75	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.50	286	23.83	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.01	23.55	287	23.92	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.
1.02	0.00	288	24.00	9.	4558.	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.	97.	812.4	9.	22.

STATION000002

\*QVF\*

	0.	50.	100.	150.	200.	250.	300.	350.	400.	450.	500.	550.	600.	650.	700.	750.	800.	850.	900.	950.	1000.
.05 11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.10 21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.15 31	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.20 41	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.25 51	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.30 61	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.35 71	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.40 81	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.45 91	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.50 101	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
.55 111	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.00 121	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.05 131	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.10 141	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.15 151	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.20 161	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.25 171	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.30 181	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.35 191	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.40 201	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.45 211	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.50 221	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.55 231	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.00 241	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.05 251	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.10 261	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.15 271	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.20 281	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.25 291	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.30 301	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.35 311	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.40 321	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.45 331	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.50 341	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.55 351	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.00 361	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.05 371	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.10 381	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.15 391	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.20 401	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.25 411	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.30 421	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.35 431	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.40 441	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.45 451	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.50 461	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.55 471	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.00 481	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.05 491	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.10 501	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.15 511	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.20 521	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.25 531	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.30 541	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.35 551	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.40 561	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.





15.05181.	0.
15.10182.	0.
15.15183.	0.
15.20184.	0.
15.25185.	0.
15.30186.	0.
15.35187.	0.
15.40188.	0.
15.45189.	0.
15.50190.	0.
15.55191.	0.
16.00192.	0.
16.05193.	0.
16.10194.	0.
16.15195.	0.
16.20196.	0.
16.25197.	0.
16.30198.	0.
16.35199.	0.
16.40200.	0.
16.45201.	0.
16.50202.	0.
16.55203.	0.
17.00204.	0.
17.05205.	0.
17.10206.	0.
17.15207.	0.
17.20208.	0.
17.25209.	0.
17.30210.	0.
17.35211.	0.
17.40212.	0.
17.45213.	0.
17.50214.	0.
17.55215.	0.
18.00216.	0.
18.05217.	0.
18.10218.	0.
18.15219.	0.
18.20220.	0.
18.25221.	0.
18.30222.	0.
18.35223.	0.
18.40224.	0.
18.45225.	0.
18.50226.	0.
18.55227.	0.
19.00228.	0.
19.05229.	0.
19.10230.	0.
19.15231.	0.
19.20232.	0.
19.25233.	0.
19.30234.	0.
19.35235.	0.
19.40236.	0.
19.45237.	0.
19.50238.	0.
19.55239.	0.
20.00240.	0.
20.05241.	0.
20.10242.	0.



PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)  
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

PLAN RATIO 1  
1.00

HYDROGRAPH AT 000001 ( .25 1 449.  
 .651 ( 12.721)  
 ROUTED TO 000002 ( .25 1 50.  
 .651 ( 1.411)



# SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....	ELEVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	STORAGE	811.60	811.60	812.60
	OUTFLOW	77.	77.	102.
		0.	0.	33.

RATIO	MAXIMUM	MAXIMUM	MAXIMUM	DURATION	TIME OF	TIME OF
OF	RESERVOIR	DEPTH	STORAGE	OUTFLOW	OVER TOP	MAX OUTFLOW
PMF	W.S.ELEV	OVER DAM	AC-FT	CFS	HOURS	HOURS
1.00	812.02	.22	107.	50.	4.92	13.75
						0.00

**DAT  
FILM**